

Efficacy of Ultrasonic Therapy in Treating post Partum Coccydynia Following Vaginal Delivery

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ABSTRACT

This study was conducted to determine the efficacy of ultrasonic therapy in treating post partum coccydynia following vaginal delivery. Thirty volunteers multiparus women suffering from post partum coccydynia for at least six weeks following vaginal delivery were participated in this study. They were referred from the outpatient clinic of orthopedic and outpatient clinic of gynecology in Kasr El Aini University Hospital. Their age ranged from 25 to 35 years old with a mean value 31.75 ± 2.56 yrs, parity ranged from (2-4) and their body mass index not exceed 32 kg/m^2 with a mean value $28.93 \pm 2.70 \text{ kg/m}^2$. The patients were divided randomly into two equal groups (A&B). Patients in group A (study group) were treated by ultrasonic on the coccygeal region in addition to pelvic floor exercises together with postural correction training, three times per week for 12 sessions while, patients in group B (control group) were treated by pelvic floor exercises together with postural correction training, three times per week for 12 sessions. All patients in both groups (A&B) were evaluated by present pain intensity (PPI) scale and plasma cortisol level before starting and after the end of treatment program. The results showed a highly significant ($P < 0.001$) decrease in PPI as well as plasma cortisol level after the treatment program in both groups, yet this decrease was more pronounced and statistically significant ($P < 0.001$) in the study group when compared to the control group. So, it could be concluded that ultrasonic therapy is an effective modality in alleviating post partum coccydynia.

Key words: Electrotherapy - ultrasonic therapy - coccydynia - plasma cortisol level - pelvic floor exercises.

INTRODUCTION

Coccydynia is a painful condition of the terminal portion of the spine⁷. It can result from varying number of causes, parturition being one of them¹³.

In humans, the coccyx serves an important function, being an attachment site for various muscles. One of the muscles inserting on the anterior coccyx is the levator ani, including the ischiococcygeus, iliococcygeus, and pubococcygeus muscles while, one of the muscles originating on the posterior coccyx is the gluteus maximus, which functions to extend the hips during ambulation¹.

The coccyx may serves as a weight-bearing structure when a person is seated, thus completing the tripod of weight bearing composed of the coccyx and the bilateral ischium. The coccyx bears more weight when the seated person is leaning backward; therefore, many patients with coccydynia sit leaning forward (flexing at the lumbosacral and hip regions), which shifts more of the weight to the bilateral ischium rather than the coccyx. Alternatively, patients with coccydynia may sit leaning toward one side so that the body weight is exerted mainly on one ischial tuberosity, with less pressure on the coccyx. Such side leaning may lead to concomitant ischial bursitis in addition to the antecedent coccydynia¹.

The pain of coccydynia is probably caused by disruption of the joint between the coccyx and the sacrum, but some cases may be caused by spasm of the muscles around or attached to the coccyx. Most cases of coccydynia occur in women so, it has been suggested that this is due to differences in anatomy between male and female - for instance- the sit-bones (ischial tuberosities) are about 40% further apart in women than in men, and this may leave the coccyx more exposed and vulnerable. Because the majority of cases were found to be aggravated by pregnancy and childbirth, so it is possible that the greater frequency of coccydynia in women is related to these factors²⁰.

Hormonal changes in a woman's body during pregnancy change the actual physical structure of her ligaments and joints, including coccyx. The coccyx is relaxed and loosened to facilitate an easier birth, this change may sometimes result in coccygeal injury or coccygeal pain¹³.

Childbirth is usually related to damage of the sacrococcygeal ligaments during vaginal delivery and the passage of the fetus through the birth canal may cause acute trauma to the coccyx, this can be further aggravated by forceps delivery²¹. Although strains and sprains of the ligaments attached to the coccyx have been thought to be the usual cause for coccydynia occurring after childbirth, an intrapartum coccygeal fracture or dislocation can result in the same complain¹³.

The most common symptom of post partum coccydynia is pain in the tail bone, this pain may be worsened with hip extension activities, such as stair climbing, sitting for long time and rapid getting from sitting to standing³.

For woman after delivery, specific advice and considerations may needed to be given in relation to her posture, position and

comfort, especially during breast feeding. Modern furniture, both in and out of hospital, does not facilitate a good breast feeding posture while seated. The furniture may be too soft to encourage women to lean into wrong position which will put pressure on the coccyx²⁰.

Obesity was found to be a risk factor. The body mass index determines the way by which a subject sits down. Posterior luxation of coccyx is most common in obese (fat) patients. This is probably because obese people: (1) often drop themselves into a chair, rather than lowering themselves, and (2) don't rotate the lower part of the spine forwards when sitting down, so their coccyxes point downwards more than forwards thus sitting causes an increase in pressure in the tissues in front of the coccyx, pushing the coccyx backwards¹¹.

Coccydynia (tailbone pain) can frustrate patients and significantly impair quality of life, but relief is possible¹⁷. Since the levator ani muscles are attached to the coccyx, Peyton (1998)¹⁸ suggested pelvic floor exercises as a method of treatment for coccydynia, however, acute treatment for possible fracture or dislocation would normally involve rest as any movement involving these muscles will increase the pain.

The ability of pelvic floor muscles to increase stiffness (stability) of the pelvic ring is of importance in patients with impairment of pelvic stability. Increased activity of these pelvic floor muscles might compensate for loss of pelvic stability by stiffening the pelvic ring and restoring proper load transfer through the lumbo-pelvic region¹⁹.

Physical therapy for coccydynia may involve manual working on tight, painful muscular structures such as the levator ani specially pubo coccygeus and piriformis muscles⁷.

Manual treatments consist in either manipulations of the coccyx or massages of the pelvic muscles (levator ani or piriformis). Manipulations consist in mobilizations of the coccyx and stretching of the attached muscles with a rectal finger¹⁰.

Ultrasound is one of several rehabilitation interventions suggested for the management of pain⁴ and it is one of the most frequently modalities used by physiotherapist for treatment of painful conditions¹⁴.

Therapeutic ultrasound may be used in pulsed or continuous form, where heat, micro massage, alteration in membrane permeability have been attributed to ultrasound effects². The ultrasound energy must be absorbed by the tissues to produce physiological changes. Protein rich hydrophilic tissues, such as muscle, joint, capsules, tendons, and extracellular ligaments can readily absorb ultrasound energy. So, ultrasound has been found as a useful therapeutic modality for the relief of muscular and tendinous spasm¹².

This study was conducted to investigate the effects of ultrasonic in alleviating post partum coccydynia, so that, this might answer a question about the efficacy of ultrasonic therapy on the treatment of coccydynia following vaginal delivery.

SUBJECTS, MATERIAL AND METHODS

Subjects

This study was carried out on thirty volunteers multiparus women suffering from post partum coccydynia for at least six weeks following vaginal delivery. They were referred from the outpatient clinic of orthopedic and outpatient clinic of gynecology in Kasr El Aini University Hospital. Patients with neurological diseases, skin diseases, genital prolapse, deformity of the back and/or coccygeal fracture were excluded. The age of the participants ranged from 25 to 35 years old, parity ranged from (2-4) times and their body mass index not exceed 32 kg/m^2 (as shown in table 1). The patients were divided randomly into two equal groups (A&B).

Group A (study group): 15 patients who were treated by 10 minutes of ultrasound on the coccygeal region with intensity of 2 W/cm^2 in addition to 20 minutes of pelvic floor contraction and relaxation exercises together with postural correction training, three times per week for 12 sessions.

Group B (Control group): 15 patients who were treated by 20 minutes of pelvic floor contraction and relaxation exercises together with postural correction training, three times per week for 12 sessions.

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

	Study group (A)	Control group (B)	t-value	P-value	Significance
Age (yrs)	32.50±2.12	31.85±3.02	0.69	0.53	N.S
BMI (kg/m ²)	28.31±3.05	29.56±2.35	0.81	0.40	N.S
Parity	2.93±0.41	2.91±0.43	1.34	0.19	N.S

Material

I- For evaluation:

a- Present pain intensity scale (PPi)

Graphic rating scale with numerical values placed equidistantly along a line. The descriptors and numbers help the subject to

place her estimate of pain on the line ranged from (0-4). It was used assess pain for all cases in both groups (A&B) before starting and after the end of the treatment program.

b- Blood sample analysis:

a sample of blood from each woman participated in this study was analyzed to estimate plasma cortisol level for all cases in both groups (A&B) before starting and after the end of the treatment program.

II- For treatment:

Ultrasonic equipment: Phyaction 190, duty-cycle continuous 1: 1, intensity 0-2 w/cm² at 0.8 MHz, continuous pulse with 4 cm² head, frequencies 0.8 MHz and 3.3 MHz, was used for treatment of patients in the study group (A).

Procedures

I- Evaluative procedures:

Before engagement to the study, each patient was subjected to careful history taking and dynamic X-ray to confirm diagnosis. Then, by using present pain intensity scale (ppi), she was asked to score her intensity of pain as being, no pain = 0, mild pain = 1, moderate pain = 2, severe pain = 3, unbearable pain = 4. Also, a morning (fasting) blood sample of about 5cm³ was drawn from the antecubital vein and analyzed to estimate plasma cortisol level. The evaluative procedures were done before starting and after the end of the treatment program for all patients in both groups (A&B).

II- Treatment procedures:

For group (A): 15 patients were treated 3 times per week for 12 sessions. The duration of the treatment session was 30 minutes classified as follow:

- 10 minutes for ultra sonic therapy: The patient was asked to lie in prone lying position, head turned to one side and rested on the hands. The ultrasound head was cleaned with alcohol to avoid any infection transmitted to the patient, then the adaptor plug inserted to the device .After exposing and cleaning the treatment area, adequate amount of sono-gel was placed on the

ultrasound head and the machine was adjusted at intensity of 2w/cm². Ten minutes of ultrasound on the coccygeal region was done.

- 10 minutes for pelvic floor muscle exercises: The patient was asked to assume crock lying position, contract both anterior and posterior fibers of the pelvic floor muscle (pubo-vaginalis and pubo-rectalis) and draw her vagina up, for 5 seconds, followed by 10 seconds relaxation for ten repetitions. Then one minute of rest was given and the process repeated.
- 10 minutes for postural correction training: Postural correction training from crock lying, supine lying, sitting and standing with more concentration on posture while sitting was given for each patient.

For group (B): 15 patients were treated 3 times per week for 12 sessions. The duration of the treatment session was 20 minutes classified as 10 minutes of pelvic floor exercises and 10 minutes of postural correction training by the same technique as in group (A).

Statistical Analysis

- Data were summarized using the arithmetic mean, standard deviation (SD) and percentage of change.
- The student's t-test used for comparison of data collected from both groups before starting and after the end of the treatment program.

RESULTS

The mean value score of the present pain intensity (ppi) scale in patients of the study group (A) before starting the treatment was 3.35±0.15, it was decreased to 2.04±0.39 after the treatment, with a percentage of improvement (decrease) equal 39.1%. In patient of the control group (B), the mean value of (ppi) was 3.27±0.04, it was decreased

to 2.58 ± 0.53 after the treatment, with a 21.1% as shown in table (2) and fig. (1). percentage of improvement (decrease) equal

Table (2): Present pain intensity score before starting and after the end of treatment program for both groups (A&B).

	Study Group (A)		Control Group (B)	
	Before treatment	After treatment	Before treatment	After treatment
Mean \pm S.D.	3.35 ± 0.15	2.04 ± 0.39	3.27 ± 0.04	2.58 ± 0.53
Mean Difference	1.31 ± 0.34		0.69 ± 0.40	
t-value	19.24		6.62	
P-value	<0.001		<0.001	
% of change	39.1%		21.1%	

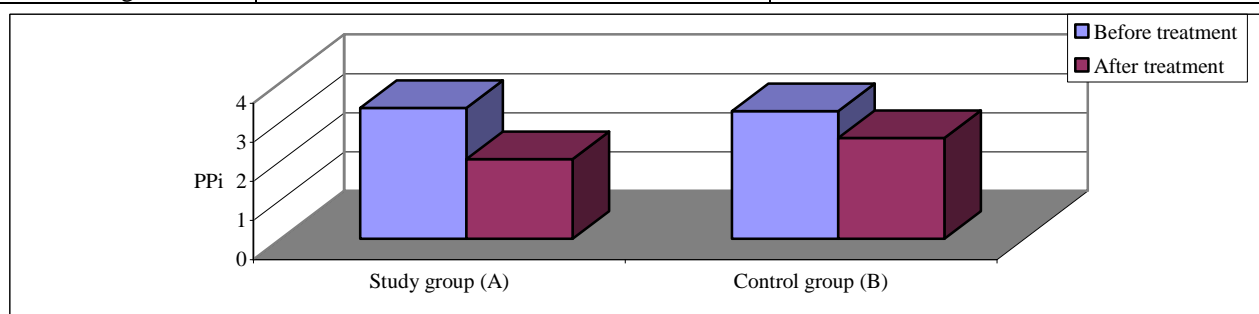


Fig. (1): Present pain intensity score before starting and after the end of treatment program for both groups (A & B).

On comparing the mean value of (PPI) in patients of the study group (A) to that of the control group (B), a highly statistical significant ($P < 0.001$) decrease in the study

group was found. The percentage of decrease in (PPI) in group (A) than group (B) was 20.10% as shown in table (3) and fig. (2).

Table (3): Comparison of pain intensity after the end of treatment program for both groups (A&B).

	Study Group (A)	Control Group (B)
Mean \pm S.D.	2.04 ± 0.39	2.58 ± 0.53
Mean Difference	0.54 ± 0.14	
t-value	5.87	
P-value	<0.001	
% of difference	20.10%	

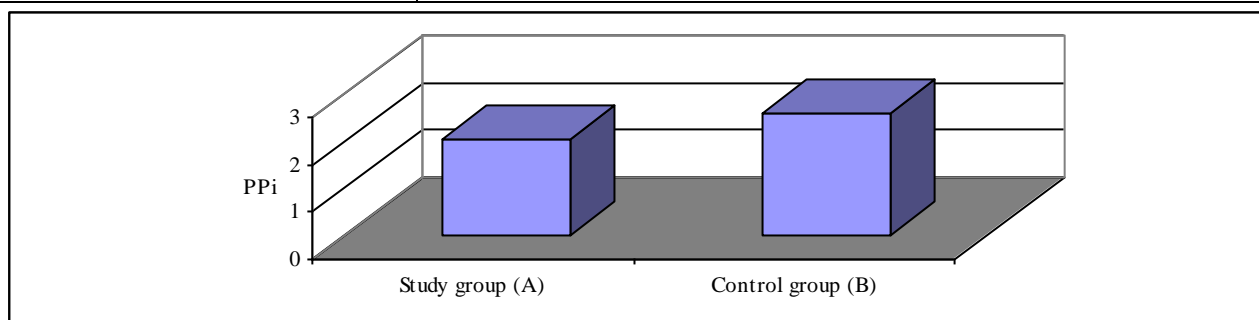


Fig. (2): Comparison of pain intensity after the end of treatment program for both groups (A&B).

Plasma cortisol level before starting and after the end of treatment program for both groups (A&B) were compared and a statistical significant ($P < 0.001$) decrease was observed in both groups following the treatment, yet this

decrease was more pronounced and statistically significant ($P < 0.001$) in the study group when compared to the control group as observed in table (4) and figs. (3&4).

Table (4): Plasma cortisol level before starting and after the end of treatment program for both groups (A&B).

	Study Group (A)	Control Group (B)
Before treatment	10.38±2.86	10.26±2.91
After treatment	7.18±2.09	8.69±2.03
Mean Difference	3.20±0.77	1.57±0.88
T-value	10.02	6.02
P-value	<0.001	<0.001
% of difference	30.83%	15.30%

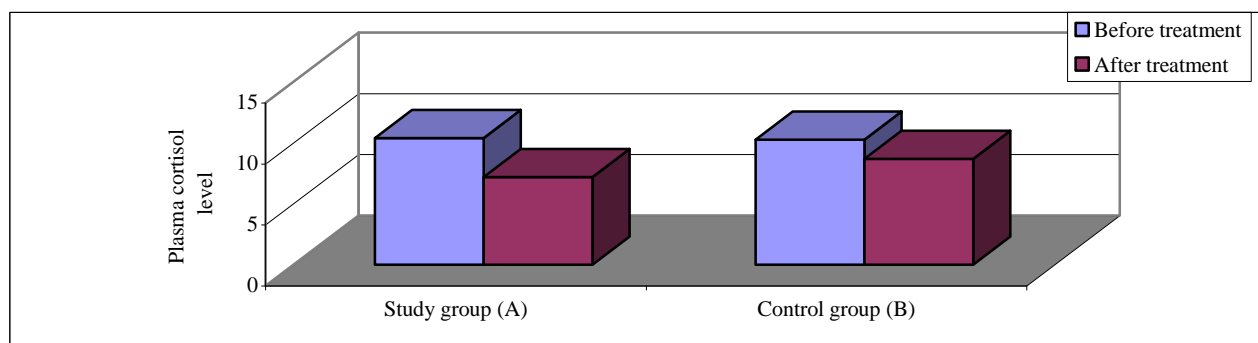


Fig. (3): Plasma cortisol level before starting and after the end of treatment program for both groups (A&B).

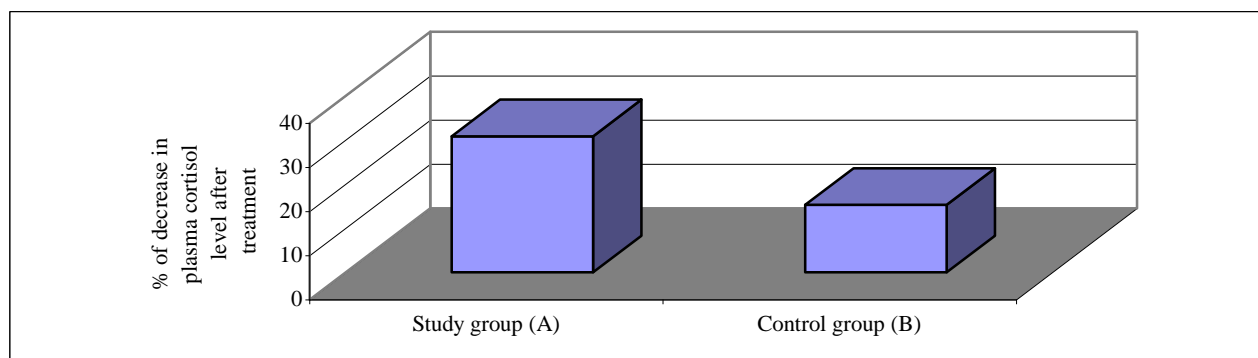


Fig. (4): Percentage of change (decrease) in Plasma cortisol level after the end of treatment program for both groups (A&B).

DISCUSSION

Coccydynia, or tailbone pain, is a fairly rare and poorly understood condition that can cause persistent low back pain. It is felt as a localized pain at the very bottom of the spine (the coccyx) and generally felt worse when sitting. The condition is much more common in women than men. It is usually caused by local trauma (a fall) or giving birth. Coccydynia due to these causes is usually not permanent, but it may become very persistent and chronic if not controlled⁵.

Local conservative treatments are usually sufficient to control or alleviate the pain. Rarely, surgical removal of the coccyx may be necessary⁷.

Various manual treatments have been described for the treatment of coccydynia including levator ani massage and stretch as well as joint mobilization⁹.

As therapeutic ultrasound aids pain relief; and affects healing of damaged tissue⁸, the current study was conducted to investigate the effects of ultrasonic therapy in alleviating post partum coccydynia following vaginal delivery.

The results of this study showed a highly significant ($P < 0.001$) decrease in present pain intensity (PPI) scale as well as plasma cortisol level after the treatment program for patients in both groups (study & control). This decrease was more pronounced and statistically significant ($P < 0.001$) in patient who received ultrasonic therapy in addition to pelvic floor muscle exercises and postural correction training (study group) than those treated by pelvic floor muscle exercises and postural correction training only.

As many previous researches had studied the effect of ultrasonic therapy on different painful and inflammatory conditions but none of them studied the effect of ultrasonic on

coccydynia, the results of the current study are similar to be in agreement with Mortimer and Dyson (1982)¹⁵, who concluded that therapeutic ultrasound is a very effective procedure in cases of post natal trauma due to the beneficial physiological effects of heating, these include an increased blood flow, increased extensibility of collagenous tissue, control pain and decrease muscle spasm.

It is also in agreement with Gam and Johansson, (1995)⁶, who stated that ultrasound accelerates restoration of tissue regeneration, increase pain threshold, stimulate bone growth and increase tendon extensibility, thus, ultrasound therapy is being used in physical therapy to relieve pain and joint mobility.

The decrease in (PPI) scale in patients who treated by pelvic floor muscle exercises and postural correction training is in agreement with JeanYves Maigne (2001)⁹, who conducted an open study to compare different modalities used to treat coccydynia and found that the addition of manipulation to injection treatment produced a 25% increase in satisfactory results than injection alone. In addition, the results of his study revealed that massage and stretch of levator ani muscle were more effective than joint mobilization.

These results are also supported by Vacek et al. (2000)²², who studied the influence of hip extension movement on coccygeal pain and found that therapeutic relaxation of the gluteal and pelvic floor muscles is associated with electromyographic activation of these muscles which may influence diagnosis, and treatment of low back and coccygeal pain.

The decrease in plasma cortisol level being obtained in this study following the treatment program is supported by Murton et al. (1998)¹⁶, who reported a decrease in cortisol level associated with decreased pain. In addition, they found that there is a positive

correlation between the results of visual analogue scale (VAS) and plasma cortisol level.

In summary, this study concludes and adds an evidence that therapeutic ultrasound is an excellent non pharmacologic, non invasive method for alleviating post partum coccydynia.

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الملخص العربي

تأثير الموجات فوق الصوتية في علاج الآلام العصبية لدى السيدات بعد الولادة الطبيعية

تهدف هذه الدراسة إلى تقييم مدى تأثير الموجات فوق الصوتية في علاج الآلام العصبية لدى السيدات بعد الولادة الطبيعية. تم إجراء الدراسة على ثلاثين سيدة متطوعة تعانين من آلام في الفقرات العصبية بعد الولادة وكانت أعمارهن تتراوح ما بين 25-35 عاما وعدد مرات الولادة بين (2-4) مرات ولا يزيد معدل كتلة الجسم لأي منهن عن 32 كجم /م² تم اختيارهن من العيادة الخارجية لقسم العظام وقسم أمراض النساء بمستشفى قصر العيني الجامعي . وقد تم تقسيم المريضات عشوائيا إلى مجموعتين متساويتين في العدد (أ & ب) تم علاج المريضات في المجموعة أ (مجموعة الدراسة) بواسطة الموجات الصوتية على المنطقة العصبية بالإضافة إلى تمارينات لعضلات الحوض الرافعة مع تمارينات تعديل القوام لعدد 12 جلسة بواقع ثلاث جلسات أسبوعيا لمدة أربعة أسابيع ، بينما تم علاج المريضات في المجموعة ب (المجموعة الضابطة) بواسطة تمارينات عضلات الحوض الرافعة مع تمارينات تعديل القوام لنفس الفترة الزمنية ، وقد تم تقييم المريضات في المجموعتين عن طريق مقياس شدة الألم وكذلك قياس نسبة الكورتيزول في الدم قبل بداية وبعد الانتهاء من البرنامج العلاجي (12 جلسة) . وقد أسفرت النتائج عن وجود نقص ذو دلالة معنوية عالية في الإحساس بشدة الآلام العصبية وكذلك نقص في نسبة الكورتيزول في الدم بعد البرنامج العلاجي للمريضات في كلتا المجموعتين غير أن هذا النقص كان أكثر وضوحا ودلالة في مجموعة الدراسة عند مقارنتها بالمجموعة الضابطة مما يمكن معه استخلاص أن الموجات فوق الصوتية لها تأثير فعال في علاج الآلام العصبية لحالات ما بعد الولادة ويمكن التوصية باستخدامها كعلاج فعال في علاج مثل هذه الحالات كبديل للوسائل العلاجية الأخرى مثل العقاقير التي قد ينتج عنها آثار جانبية خطيرة .