Allay Period Relief Patch
Menstrual Pain
Clinical Study

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Summary

Objectives: To test the safety and effectiveness of a wearable Pulsed ElectroMagnetic Field device (PEMF), called the Allay Period Relief Patch, for the symptomatic relief of the pain associated with dysmenorrhea.

Design: A prospective randomized double-blinded and positive controlled clinical trial was conducted in two different cities (Indianapolis and San Francisco) of randomly selected women between the ages of 18 to 35 who experience moderate to severe menstrual pain. Allay Patches were asked to be worn at the onset of one's menstrual cycle and worn for five consecutive days. Prior to wearing the patch each women recorded her level of pain during a traditional menstrual cycle. The outcome measure while wear the patch was then was compared to that of their traditional cycle pain.

Participants: Ninety-one (91) women were enrolled with moderately severe dysmenorrhea and were randomly assigned an active or control Allay Patch.

Results: Of the ninety-one (91) study enrollees, forty-four (44) were from San Francisco and forty-seven (47) from Indianapolis. Forty-eight (48) patients had active patches while the remaining thirty-five (35) were placebos. The average age of study patients was 26.2 years.

Of the active patch group, thirty-seven (37), which represents 77.1% of the group, reported either complete elimination or reduction in their typical menstrual pain symptoms. Four (4) patients in the active patch group reported no pain at all (10.8%) while the average amount of pain reduction in the remainder was 55%. (range 10 - 95%) 48.6% (18) showed least a 50% pain reduction.

In the active responder control group (placebo), no patients (4) reported complete elimination of pain while the reduction in pain averaged 20%. The differences in positive response to either the active or control patch was of statistical significance. ($p < 0.05$)

Conclusions: The Allay Patch is an effective and safe non-drug method for use in the treatment of primary dysmenorrheal. It can be used as a primary treatment method for those women with moderate dysmenorrhea who do not prefer to take medication. In more severe cases of dysmenorrheal, it can be an adjuvant treatment to reduce the amount of duration or other oral medications.

Introduction

Cramping and pain are common problems for many women during their menstrual period. Sharp pains in the lower abdomen begin at the start of menstruation and may continue for 3 to 4 days. The pain can range from mild to severe and often interferes with many normal activities. While the majority of women who have menstrual periods have some discomfort, 10% or more are temporarily disabled by the high level of pain that they experience.

Many different treatment strategies have been tried for menstrual pain but the most commonly used are non-steroidal anti-inflammatory drugs. (NSAIDS) Despite drug therapy, universal relief is not obtained and some patients experience gastric upset and other minor problems with NSAID use. The search for a cost effective, non-drug, anti-inflammatory approach to menstrual pain would be a novel approach to this problem.

Pulsed electromagnetic stimulation (PEMF) in some form has been used or investigated since the early 1930s. There is a large body of clinical experience that has realized its value as an effective treatment for tissue trauma, particularly in the early stages of inflammation. Numerous studies are available that document its effectiveness in orthopedic surgery, arthritis, and even plastic surgery. (breast augmentation). While no study has demonstrated the complete elimination of pain or need for some medication relief, PEMF has shown less dependence on medications and some enhancement of the recovery period. Also, there has not been a single study showing any harmful effects so it is fair to conclude that PEMF is safe for human use.

The precise mechanism by which PEMF works on controlling pain after injury is not known. It is theorized that it may affect pain levels by its enhancement of nitric oxide (NO) release, a short-lived signaling molecule in the anti-inflammatory cascade. It is also suggested that it has an effect on stabilizing cell membranes such that the edema phase of an injury is less or more rapidly resolved.

Allay menstrual patches have been specifically developed for use over the uterine area ion women. Their looped design functions at a frequency in the 27.1 MHz

ISM band and are confined within the field of the patch's loop antenna. The patch induces electric current in human tissue but it is oscillating at such a high frequency that it cannot be detected by the patient. The high frequency results in a depth of penetration into the tissues of approximately 10 cm. When the patch is used over a 24 hour period, it produces an absorbed energy of 630 mJ/cc which is well within the range of effectiveness for soft tissue injuries. The patch produces a power density at the skin surface between 14 and 73 μW/cm² and induces an electrical field of about 10 milliVolt/cm, resulting in adsorbed power levels in the range of 7.3 μW/cm3. This provides field exposure levels at the target tissue that are five to nine orders of magnitude above the thresholds which have been established for non-thermal electromagnetically induced biological effects at the cell and tissue level.

An initial pilot study evaluating the effectiveness of this patch has previously been performed. From August to November 2008, twenty-three (23) female patients (ages 19 to 37) with problematic menstrual issues were willing to test the patches. They were provided with a questionnaire that allowed them to rate their menstrual pain on a 1 to 10 scale as well as a daily rating of their pain using this scale beginning on their first day of menstruation up to five days after. To serve as their own controls, they initially used these ratings on a regular menstrual cycle without Allay Patch treatment. The patient results obtained indicated that during the control period, the average composite pain rating was 7.8. (highest 10, lowest 4) From day one to five, the average composite daily pain ratings were 8.3, 7.9, 7.4, 6.5, and 5.7, respectively. During the ActiPatch treatment sessions, the average composite pain ratings was 5.4 (highest 8, lowest 2) for the same set of patients. Their average composite daily pain ratings were 5.7, 4.8, 4.3, 3.4, and 2.1 for days one through five. The correlates to an overall pain reduction of 30% and on a daily basis of 31%, 39%, 42%, 48%, and 73% respectively. This indicates as the days of menstruation went on, the amount of pain reduction continued to improve either from cumulative effects from Allay Patch therapy, a reduction in actual menstrual pain as flow decreases, or a combination of both.

Study Protocol

A pilot study assessing Allay Patches in the treatment of menstrual discomfort has shown that pain and disability from severe menstrual discomfort is reduced in some patients. This study aims to:

1. Evaluate the level of pain with patch use during the menstrual cycle using patient surveys.
2. Determine the reproducibility of pilot study results using menstrual patches.

Investigators

Principal Investigator

Barry L Eppley, MD, DMD is a highly-skilled plastic surgeon and the only plastic surgeon in the Midwest certified by both the American Board of Plastic Surgery and the American Board of Oral and Maxillofacial Surgery. He is one of nation's most educated doctors and brings a wealth of training and experience to both patients and new medical innovations. Dr. Eppley received a Doctor of Medicine degree from Washington University in St. Louis as well as a Doctor of Dental Medicine degree from the University of Pennsylvania in Philadelphia. He completed full training in Oral and Maxillofacial Surgery and Plastic and Reconstructive Surgery as well as specialty fellowships.

Dr. Eppley has prominent international experience in the investigation and development of numerous technologic advances in medicine and plastic surgery. He has been the recipient of numerous National Institute of Health and private corporate research grants and studies for the evaluation of promising surgical technologies and medical implants. As a result, he has been awarded numerous U.S. and international patents on biomedical technologies.

His research and clinical efforts have resulted in extensive contributions to medical literature, including 5 books, 225 journal articles, and 35 book chapters. Over the past 16 years, he has given over 200 presentations in 21 countries.

Dr. Eppley completed in 2009 the National Institutes of Health (NIH) Office of Extramural Research web-based training course "Protecting Human Research Participants". (certificate # 227968)

Assistant Investigator

Dr. Sheena Kong is a Board Certified Internist. Dr. Kong received a Doctor of Medicine Degree from Washington University, St. Louis, a well reputed school of medicine with significant graduate and research programs. She completed her residency in internal medicine at California Pacific Medical Center in San Francisco. Prior to medical school, she studied at Harvard University, where she graduated with a Master's Degree in Medical Sciences. Dr. Kong has an active internal medicine private practice in San Francisco, California and is part of San Francisco Internal Medicine Associates.

Review of Study Protocol

The proposed study and the device design were reviewed by Drs. Eppley (Indianapolis, IN), Kong (San Francisco,CA), Danyo (Wilmington, DE) and Corbett (Louisville, KY). It was collectively determined that the device posed no risk ("non-significant Risk-NSR) of any adverse human effects nor should its use interfere with any normal bodily functions.

The device is not an implant, is not used in supporting or sustaining life, is not of substantial importance in diagnosing, curing common mitigating or treating any disease, and does not otherwise present a potential for serious risk to health, safety or welfare of any of the study subjects. These assessments are supported the physicians personal experience with the device and by hundreds of peer-reviewed scientific studies on file at NIH and other institutions.

The study design was approved as a non-invasive survey that would not subject any study subjects to harm or increased exposure to pain.

The device, known as the Allay Period Relief Patch, is widely distributed outside of the United States and is identical, except in name to an already FDA cleared device called ActiBand (510(k) No: K022404), which is indicated, "for the treatment of edema following blepharoplasty" (cosmetic eyelid surgery) is well known for both safety and efficacy standpoints by both the principal investigator and the assistant investigator.

Study Design

- The study is a prospective randomized double-blind, placebo- and positive-controlled trial of PEMF versus placebo for menstrual pain in adult women.
- Participation is voluntary and the subject can withdraw at any time.
- Greater than 75 patients: at least 30 control and 30 active patients.
- Informed consent obtained for all study participants.
- Directions for use of the device were provided verbally upon informed consent being granted. All study subjects were also provided with written instructions and telephone contact numbers for both principal investigator and assistant investigator.
- One menstrual cycle study period.
- Age range of 18 to 35 who have menstrual cycles that they consider significant and/or disabling.
- Control patches will be identical as the actives but will not have a live battery.
- Patients will wear the patch inside their underwear for 24 hours per day for five days at the first sign of menstrual discomfort.
- Patients will be given a Pain Recording Scale sheet to record their perceived level of daily pain during their 5 day menstrual study period as well as a section to make comments at study completion.
- Patients are to take, if needed, any medications that they might normally take for pain relief during a normal menstrual cycle.

Study Results

Study Period: January 15 to May, 15 2009

Enrolled Patients: 91 Total

Eppley – Indianapolis - 47 (23 active, 24 placebo)

Kong - San Francisco - 44 (25 active, 19 placebo)

Total - 48 Active, 35 placebo

Patient Ages: 26.2 average age (range 18 – 34)

Positive Responders Active Group:	37 (77.1%)
Estimated % Pain Relief (Average)	55%
(Scale 10 – 100%)	
10 – 25% relief	9 (24.3%)
25 – 50% relief	11 (29.7%)
50 – 75% relief	14 (37.8%)
75 – 100% relief	4 (10.8%)

Negative Responders Active Group: 11 (22.9%)

Positive Responders Placebo Group: 4 (9.3%)

Negative Responders Placebo Group:	37 (90.7%)
Reported Use Rate:	
(stopped using after 1st or 2nd day)	35 (38.4%)
Positive Responders Active Group:	5 (14.3%)
Negative Responders Active Group:	11 (31.4%)
Positive Responders Placebo Group:	4 (12.9%)
Negative Responders Placebo Group:	15 (42.9%)

Adverse Events:	0

Device Issues:	3 (9.9%)
Moistness	2
Irritation	1
Other: Placement Stability	7

Commentaries

Effectiveness

"I can honestly say that I don't know if the device made me feel better or it was a psychological effect of it, but there was definitely a decrease in pain"

"I was surprised how fast I forgot I was wearing it"

'This was awesome! Absolutely no pain during the first and second days which are usually the worst."

"I had the first pain-free period of my life"

"I still got the stabbing pain while wearing the device, although it wasn't as bad"

'This product was very useful to heal my menstrual pain especially during the first day of my period. This is a better way to kill the pain than using Tylenol or other pills."

"…I swear I felt some warmth…and my normal period pain was much less severe!"

"I feel this product provided local analgesia, similar to Tylenol. I placed the product on other parts of my body where I had aches and pain…and it seemed to relieve the pains there too."

Wear Issues

"…if you make it smaller, people would be more inclined to use it."

"..I feel this product provided local analgesia, similar to Tylenol. I placed the product on other parts of my body where I had aches and pain…and it seemed to relieve the pains there too."

"….very uncomfortable. It became warm and I started to sweat…which made me not use it anymore…"

"A little awkward to wear with clothing"

"…fell out on the floor when using the bathroom."

"..it should come with something like straps or tapes to hold it into place."

Discussion

Menstrual cramps and pain are the result of contractions of the uterus. Prostaglandins stimulate the uterine muscles to contract and shed its lining. Women who have high levels of prostaglandins will experience more intense contractions of their uterus and more pain. The benefits of anti-inflammatory medications are directed towards modulating one's responsiveness to prostaglandin levels. Unfortunately, anti-inflammatory medications are not always highly effective at relieving menstrual pain and they have well-known, and increasingly discussed side effects as well. A non-drug approach to the treatment of menstrual pain would be both novel and welcome.

This clinical study has demonstrated that the Allay menstrual patch is effective at reducing and/or eliminating the pain from dysmenorrhea. It is statistically significant that the active patch group exhibited a 77% positive response compared to just a 9% positive response in the placebo. It does so with no reported side effects other than some wear issues undoubtedly related to the design or material issues of the patch. The safe of PEMF is well documented and supported by hundreds of peer review scientific studies.

The exact mechanism by which the PEMF of the Allay Patch works for menstrual pain is currently speculative. Certainly, the placebo enhancement effect plays a role but that alone can not exclusively account for the study results, particularly in the face of such a discrepant and very low positive response to the control group patches. Modulation of pain pathways is one potential explanation. Pain signals are transmitted along nerve cells to pre-synaptic terminals. PEMF has been shown to result in pre-synaptic terminals that have slowed release of neurotransmitters by altering membrane potentials thus blocking or reducing pain signals. Another potential mechanism is the well-known anti-inflammatory PEMF by affecting T-cell activity and inflammatory mediator releases. It is likely that the cumulative effect of all of these three different mechanisms accounts for the positive responses seen.

PEMF therapy appears to have a role in the management of pain from dysmenorrhea which is currently dominated by pharmaceutical and some surgical treatments. PEMF offers a noninvasive approach with no side effects and no potential for drug interactions.