

Clinical monitoring of safety and functionality of a non-medicated patch for pain alleviation associated to dysmenorrhea

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Summary. FIT[®] Lady patch is an easy-to-use class I medical device, developed to relieve pain associate to menstrual period, without pharmacological substances. The patch is based on far infrared (FIR) electromagnetic waves reflection properties that normally are emitted from the body, as a consequence of body heat dispersion between the difference of cutaneous body and ambient temperature. Consequently, infrared (IR) waves are reflected and resorbed at cutaneous level and thermal energy again locally introduced leads to a better microcirculation. Although biological IR waves properties and mechanisms of action are extensively studied, there are still few references on patches based on FIR properties. The aim of this study was the evaluation of FIR technology applied to FIT[®] Lady patch thought to be used to alleviate pain associated to menstrual period (dysmenorrhea). The FIT[®] Lady patch medical device (active patch) was evaluated in comparison with a placebo patch, in order to assess its action in reducing pain related to menstrual period in 40 women patients enrolled according to specific inclusion/exclusion criteria. This study confirmed a good tolerability of the product, by demonstrating the ability to significantly reduce inconvenience and feeling of pain. The mineral that was responsible of the reflection activity (titanium dioxide), conveniently entrapped in a patch, was able to work without any active substances in contact with and absorbed from the skin. (www.actabiomedica.it)

Key words: FIR action, FIT patch, menstrual pain, topic treatment

Introduction

There are several symptoms related to gynecologic disorders, one of which affects half of women during their reproductive period: dysmenorrhea. Dysmenorrhea is pain associated to menstruation and is characterized by spasmodic cramping pain in the lower abdomen, that can disseminate into the lower back in some cases. These symptoms can negatively impact the normal activities of women (1).

In literature there are several works studying the application of IR in between biological waves to support different pathologies and/or conditions, such as dysmenorrhea (1-2), fibromyalgia (3), chronic psy-

chosomatic associated pain (4), or to achieve a general wellness conditions (5).

In a recent single blind randomized study conducted on patients affected by knee osteoarthritis (6), the efficacy in reducing pain and joint effusion of a plaster cast containing substances that emit at far infrared (FIR) wavelength was evaluated. From ultrasound inspections it emerged a 40% reduction of patients with joint effusions after being treated with FIR technique, which was not observed in the group treated with placebo, highlighting that FIR technique can efficaciously be used as a no pharmacological option to treat different pathologies, as osteoarthritis of knee.

In another double blind randomized study with placebo (7), the efficacy of FIR technique was evaluated by considering myofascial neck chronic pain.

After a week of treatment, intensity of pain considerably decreased in all patients treated with or without FIR technique, without showing any significant difference between groups. However, a significant difference was observed in terms of muscle rigidity, which was more evident in treated group compared to the control, allowing to hypothesize a long term treatment as an effective solution to muscle rigidity problems.

A study by Wong et al. (8) evaluated the reduction of pain intensity of FIR radiation effect on post-operative patient after total knee arthroplasty. 40 patients were randomly selected to be treated with control or with tested treatment. Pads with FIR technology were placed in different acupoints including the experimental group, from the third to the fifth day after operation. The analgesic effect was evaluated with a pain intensity scale (Numeric Rating Scale, NRS). At the end of treatments, the group treated with FIR showed a reduction in pain intensity.

Although biological IR waves properties and mechanisms of action are extensively studied, there are still few references on patches based on FIR properties.

The present clinical study conducted on FIT® Lady patches was intended to demonstrate the efficacy in reducing pain associated to dysmenorrhea in women without pharmacological active substances with an easy-to-use patch. For this purpose, a titanium dioxide powder was entrapped in patches (active patches), in order to be able to reflect electromagnetic IR wavelengths normally emitted from body. These wavelengths are intended to be reabsorbed, reintroducing the energy in order to improve the wellness conditions of patients, by decreasing pain perception.

Materials and Methods

This study was carried out from April to June of 2017 as a monocentric comparative double blind study and it was conducted at Dermo-Cosmetic and Medical R&D Center of Bio Basic Europe Srl on 40 female patients affected by painful menstrual period. One group (20 patients) was treated with a placebo

patch (FIT A), while the other group was treated with the active patch (FIT C) containing mineral powder. Patients were unrolled following specific inclusion and exclusion criteria: the criteria for inclusion were women in fertility period of life, with particular painful menstrual period, while patients showing a sensitivity to one component of patch formulation were excluded.

FIT® Lady patches are 100% polypropylene non-woven fabric patches mixed with an acrylic adhesive mass containing biomaterials, in particular metal dioxide (titanium and aluminum), that is able to refract IR wavelength interval between 4 and 21 mm (in particular at 11 mm). This powder composition is called AT5.05.

Every patient had to place 3 patches respectively: one on the right ovary, one on the left ovary and the last one at L3 vertebra level, and keep them in position for 5 days.

Patches had to be used on intact skin in order to avoid any associated risks and adverse effects.

The improvement in quality of life of patient was evaluated as a reduction of discomfort. During the clinical study, the skin tolerability of patches was evaluated by measuring potential changes overtime through the clinical scores reported in Table 1.

Patients enrolled for the study were examined both at the beginning and at the end of the treatment protocol by the same operator and evaluation tool.

First evaluation: starting the treatment;

Last evaluation: at the end of the treatment (after 5 days).

The experimental data model was defined through quantitative parameter variation after the application of both types of treatment and by analyzing the same patient of a group or belonging to a different group, before and after treatments.

The aim of this clinical study was to evaluate differences between data results, in terms of significantly different, before and after the treatment (after 5 days).

The results were collected relatively to the evaluation scale, and by single patient by taking into account the decrease of pain caused by menstrual period.

The statistical analysis of clinical parameters was carried out through non-parametric Friedman test which uses a sensitivity threshold of 5% with a numeric evaluation originated by a VNS scale (values from 0 to 10).

Then personal evaluations were collected (self-assessment) in accordance with VNS scale (from 0 to 10 values). The statistical analysis of infra group self-assessment was carried out according to T-student test with a threshold of 10%.

Results

In Figure 1 it emerges that both placebo (FIT A) and active (FIT C) patches were able to maintain the integrity of skin after treatment, demonstrating a good tolerability.

In the present study, the decrease of painful perception (as a sensorial parameter) associated to menstrual

period was evaluated according to a Visual Numeric Scale, VNS (from 0 to 10) at the beginning (time 0) and at the end (after 5 days) of the treatment (Table 2). The clinical parameters were gathered by the experimenter. The graphic tendency is represented in Figure 2.

The results obtained by VNS showed that there were no significant differences between the two patient groups (FIT A and FIT C) at time 0. On the contrary, a significant statistical difference was observed between group FIT A and group FIT C after 5 days of FIT Lady patch application.

After 5 days of the medical device application, it was observed a reduction of painful perception of:

- 28% in FIT A group;
- 85% in FIT C group.

Table 1. Clinical scores of skin tolerability evaluation

Skin alterations (erythema and oedema)			
Erythema		Edema	
No erythema	0	No edema	0
Slight erythema (hardly visible)	1	Very slight edema (hardly visible)	1
Clearly visible erythema	2	Slight edema	2
Moderate erythema	3	Moderate edema (about 1mm raised skin)	3
Serious erythema (dark red with possible formation of light eschars)	4	Strong edema (extended swelling even beyond the application area)	4

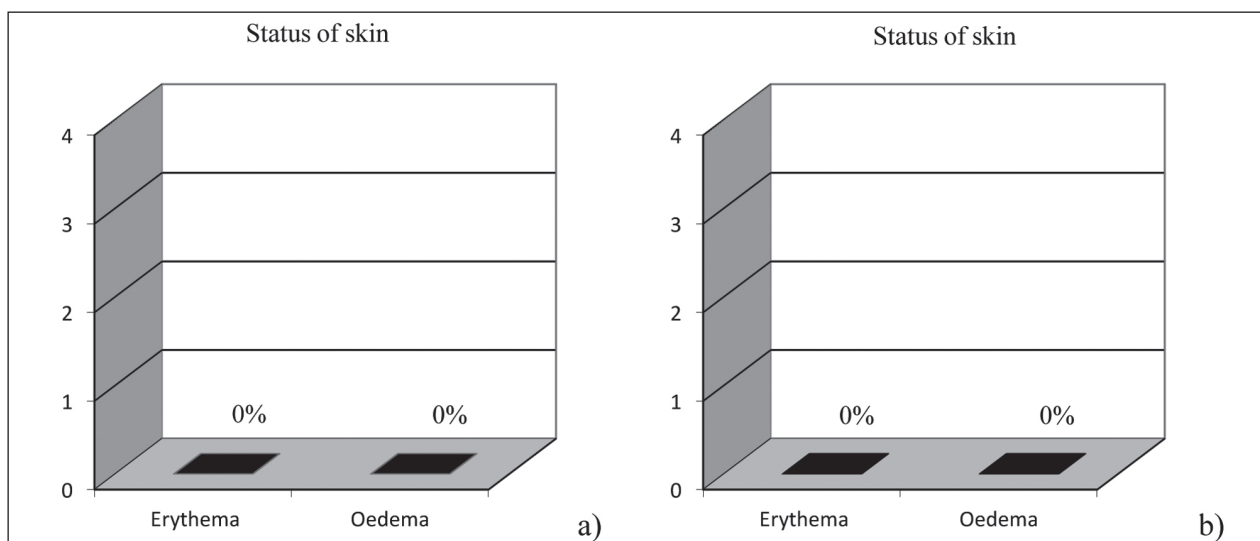


Figure 1. Evaluation of skin tolerability in accordance with the clinical scores reported in Table 1 after treatment with patches for 5 days with placebo FIT A (a) and test product FIT C (b)

Table 2. Evaluation of pain intensity related to menstrual period of patient enrolled for the study by means of VNS scale (from 0 to 10) at the beginning (T0) and after 5 days of treatment (T5)

Attenuation of painful sensation intensity during menstrual period				
Panellists' code	T0 - FIT A	T0 - FIT C	T5 - FIT A	T5 - FIT C
1	5	5	5	4
2	4	4	4	0
3	5	6	3	2
4	6	5	5	0
5	4	6	2	1
6	5	6	2	0
7	6	7	3	0
8	4	5	3	2
9	6	3	5	0
10	3	8	2	1
11	4	8	3	0
12	7	8	6	3
13	5	7	5	2
14	6	6	4	0
15	4	9	2	1
16	5	7	2	0
17	6	8	3	2
18	8	6	6	0
19	7	7	5	0
20	6	8	6	1
<i>Average</i>	5,3	6,5	3,8	1,0

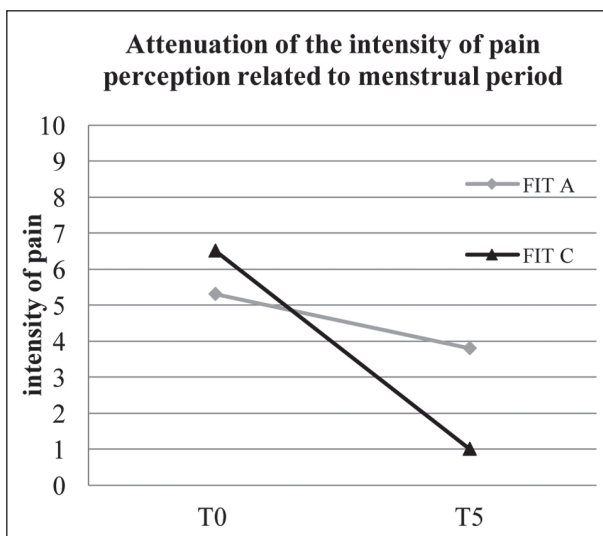


Figure 2. Evaluation of painful intensity detected by patient in accordance with a VNS sensorial scale (from 0 to 10) at the beginning (T0) and at the end (T5) of the treatment

Self-evaluation questions before (Table 3) and after (Table 4) treatment are reported. Results are presented as the average of answers given following the VNS scale.

In Figure 3 results obtained from the self-evaluation questionnaire after treatment with FIT A and FIT C patches are reported and compared to each other after 5 days.

Statistical significant differences were noted between the FIT A group and FIT C group for all questions results, only Q2 and Q5 gave the same results.

Discussion

FIT® Lady patches were developed to alleviate pain discomfort associated to dysmenorrhea. It has to be considered that dysmenorrhea is characterized by pelvic pain disseminated into lower back with spasmodic cramping, generally accompanied with nausea, fatigue and insomnia. Those clinical situations can result in loss of working hours and productivity at work, or in general can affect women's lifestyle [9], and unrelieved pain can cause damaging physiological effects.

As evidenced in literature, FIR, used at human biological IR wavelength, is an extensively studied technology used to support therapies for different pathologies or to facilitate the improvement of patient's wellbeing, also as an alternative method to useless pharmacological treatments.

FIR technology has generally been recommended as an effective, safe, and non-pharmacologic alternative to promote human health [10–11], by improving body metabolism through the resonance absorption process of the human body.

This technology was proved to be effective in different muscular-skeletal discomfort situations thanks to the application of FIT plasters based on FIR technology, as it relieved painful symptoms, by producing a myo-relaxing action on the site of application [6]. Plasters were applied to the human body taking advantage of reflecting IR normally emitted and increasing the skin's surface microcirculation.

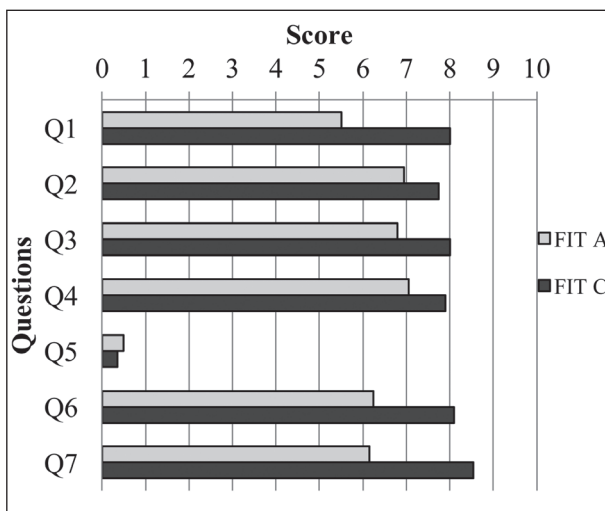
Ricci et al. conducted a pilot study on plasters base on FIT technology containing AT5.05 powder that demonstrated to have an increased radiance when temperature augmented obtaining a maximum dif-

Table 3. Self-evaluation questionnaire according to the VNS scale (visual numeric scale) by the 20 patients treated with the tested patch FIT A (placebo)

Questions	Average (VNS)
Q1 Evaluate the relief sensation respect to menstrual pain during product use.	5.50
Q2 Evaluate the practicality of the product application	6.95
Q3 Evaluate the comfort of using the product	6.80
Q4 Evaluate the adhesiveness of the product (even after contact with water)	7.05
Q5 Evaluate the presence of glue at the end of the treatment	0.50
Q6 Overall opinion	6.25
Q7 Give the evidence of a possible purchase	6.15

Table 4. Self-evaluation questionnaire according to the VNS scale (visual numeric scale) by the 20 patients treated with the tested patch FIT C (FIT Lady)

Questions	Average (VNS)
Q1 Evaluate the relief sensation respect to menstrual pain during product use.	8.00
Q2 Evaluate the practicality of the product application	7.75
Q3 Evaluate the comfort of using the product	8.00
Q4 Evaluate the adhesiveness of the product (even after contact with water)	7.90
Q5 Evaluate the presence of glue at the end of the treatment	0.35
Q6 Overall opinion	8.10
Q7 Give the evidence of a possible purchase	8.55

**Figure 3.** Average results of values recorded in accordance with VNS scale obtained from patient treated for 5 days both with placebo patch (FIT A) and “active” patch (FIT C)

ference in emission within the wavelength 9-12 nm, where 11 nm is considered the emission wavelength of the body’s infrared radiation. In accordance with their preliminary study, they demonstrated that FIT plasters

increased functionality and reduced pain when applied to patient with degenerative tendinopathy [12].

Given these premises, FIT Lady patches underwent a clinical study on 40 women with particular painful menstrual period. For this evaluation patches were applied for 5 continuous days on volunteers whom were asked to give a feed-back on alleviation of intensity of pain associated to menstrual symptoms in accordance with a VNS scale.

FIT® Lady Patches were manufactured with AT5.05 powder, made up of biomaterials, metal dioxides (titanium) in prevalence, that are able to reflect within the infrared range (between 4 and 21 nm). FIT® Lady patches (FIT C), based on FIR technology, had demonstrated a good tolerability and ability to relieve menstrual pain if compared to the placebo patches (FIT A). Moreover, the product was able to improve the quality of life of women during their menstrual period.

Those evaluations were based on patients’ testimonies on pain feeling. The self-assessment of patient enrolled for this study is to be considered the only possible measurement of pain, since pain is a personal and com-

plex perception based on a physiological transmission of stimuli to brain and subjective experience of it. Several studies had evidenced that there is an underestimated perception of pain when data are collected from external person, such as doctors and nurses. The WHO defined pain as “an unpleasant sensation and emotive experience, that is associated to a potential or real tissue damage, or in any case, described in relation to this damage”.

In this case, the application of an evaluation tool was fundamental in order to improve the relationship and the communication between patient and doctor and to get a better diagnosis. Among different scales, the one-dimensional (VAS, NRS, VRS) is a valid tool of evaluation.

In this study, VNS (Visual Numeric Scale) scale was used to get the self-evaluation of patient. This scale is a combination of a VAS scale (Visual Analogic Scale) and a NRS scale (Numeric Scale). The results gathered from this study on Class I Medical Device demonstrated a good cutaneous tolerability, without any erythema or oedema episodes after 5 days of application. Moreover, the results obtained from the self-evaluation questionnaire based on VNS evidenced that FIT® Lady patches were able to give a general wellness perception to patients.

Conclusions

In conclusion, FIT® Lady patches, based on FIR technology, had proved to be well tolerated and to be an useful support to treat painful symptoms associated to menstrual period, as demonstration by the improvement in the patients quality of life.

Based on the safety and good tolerability of the product and the promising results obtained, we can stated that FIT® Lady patches may be a valid alternative to “non-medicated pain relief” treatment during dysmenorrhea.

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References

1. Lee CH, Roh JW, Lim CY, Hong JH, Lee JK, Min EG. A multicenter, randomized, double-blind, placebo-controlled trial evaluating the efficacy and safety of a far infrared-emitting sericite belt in patients with primary dysmenorrhea. *Complement Ther Med* 2011; 19(4): 187-93
2. Ke YM, Ou MC, Ho CK, Lin YS, Liu HY, Chang WA. Effects of somathermal far-infrared ray on primary dysmenorrhea: a pilot study. *Evid Based Complement Alternat Med* 2012, Article ID 240314, 8 pages, doi: 10.1155/2012/240314.
3. Matsushita K, Masuda A, Tei C. Efficacy of Waon therapy for fibromyalgia. *Intern Med* 2008; 47(16): 1473-6.
4. Masuda A, Koga Y, Hattanmaru M, Minagoe S, Tei C. The effects of repeated thermal therapy for patients with chronic pain. *Psychother Psychosom* 2005; 74(5): 288-94.
5. Conrado LA, Munin E. Reduction in body measurements after use of a garment made with synthetic fibers embedded with ceramic nanoparticles. 2011; 10(1): 30-5.
6. Bagnato GL, Miceli G, Atteritano M, Marino N, Bagnato GF. Far infrared emitting plaster in knee osteoarthritis: a single blinded, randomised clinical trial. *Reumatismo* 2012; 64(6): 388-94.
7. Lai CH, Leung TK, Peng CW, Chang KH, Lai MJ, Lai WF, Chen SC. Effects of far-infrared irradiation on myofascial neck pain: a randomized, double-blind, placebo-controlled pilot study. *J Altern Complement Med* 2014 Feb; 20(2): 123-9.
8. Wong CH, Lin LC, Lee HH, Liu CF. The analgesic effect of thermal therapy after total knee arthroplasty. *J Altern Complement Med* 2012; 18(2): 175-9.
9. Daily JW, Zhang X, Da Sol K, and Park S. Efficacy of Ginger for Alleviating the Symptoms of Primary Dysmenorrhea: A Systematic Review and Meta-analysis of Randomized Clinical Trials. *Pain Medicine* 2015; 16: 2243-2255.
10. Lee CH, Roh JW, Lim CY, Hong JH, Lee JK, Min EG. A multicenter, randomized, double-blind, placebo-controlled trial evaluating the efficacy and safety of a far infrared-emitting sericite belt in patients with primary dysmenorrhea. *Complement. Ther Med* 2011; 19: 187-193.
11. Masuda A, Koga Y, Hattanmaru M, Minagoe S, Tei C. The effects of repeated thermal therapy for patients with chronic pain. *Psychother. Psychosom* 2005; 74: 288-294.
12. Ricci M, Micheloni GM, Parusi F, Corbo VR, Vecchini E, Magna B. Use of a non-medicated plaster in shoulder tendinopathies. *Acta Biomed* 2016; 87(1): 90-94.

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