RESEARCH ARTICLE

Short Wave Diathermy in the Symptomatic Management of Chronic Pelvic Inflammatory Disease Pain: A Randomized Controlled Trial

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Abstract

Background and Purpose. Chronic pelvic inflammatory disease (PID) refers to both residue of acute and sub-acute recurrence of a previous infection or/and as a result of late detection of and intervention for upper tract pelvic infection. Owing to the chronic nature of the disease, which may require large doses of analgesics and/or antibiotics both of which may have side effects on the body, there is a need for a non-invasive therapeutic and symptomatic chronic pain management. The main purpose of this study was to determine the efficacy of short wave diathermy (SWD) in the symptomatic management of chronic PID pain. Method. An independent group; double blind random assignment design was used in data collection. A total of 32 subjects diagnosed as chronic PID patients referred for physiotherapy were randomly assigned to three (SWD, control and analgesic) groups. The SWD group received antibiotics, placebo (sham analgesic) tablets and SWD using the crossfire technique for an average of 15 exposures lasting for 20 minutes on alternate days of the week. Other groups; Analgesic group received antibiotics, Analgesics and sham SWD; while the control group received antibiotics, sham SWD and placebo tablets. The study lasted for a period of 30 days. Result. Findings of the study revealed significant effect of SWD over analgesic and control in pain responses and resolution of inflammation at \( p < 0.05 \). Conclusion. It was concluded that SWD may be an effective and non invasive therapy in the management of chronic PID pain. Copyright © 2010 John Wiley & Sons, Ltd.

Received 21 September 2009; Revised 23 March 2010; Accepted 1 April 2010

Keywords
chronic PID; pain; physiotherapy; SWD

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Published online 18 June 2010 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/pri.473

Introduction

Pelvic inflammatory disease (PID) and upper genital tract infection describe inflammatory changes in the upper female genital tract of any of the following combination: endometritis, salpingitis, tubo-ovarian abscess and peritonitis in the small pelvis and in most cases the infection is ascending. The spectrum ranges from sub-clinical, asymptomatic infection to severe, life-threatening illness (Haggerly and Ness, 2006;
Hoof, 2007; Smith et al., 2008). The symptoms of PID are recurrent and chronic abdominal and pelvic pain, dyspareunia, dysmenorrhea, menorrhagia, rectal discomfort and smelly vaginal discharge (Llewellyn-Jones, 1998; Tzafettas, 2006; Hoof, 2007). Tubal sterility and ectopic pregnancy, tubo-ovarian abscess are the long term sequelae (Gray-Swan and Peipet, 2006; Smith et al., 2008). Though, Chronic PID is no longer common in developed countries, but still poses a significant problem with chronic pain in the Third World (EAU, 2007).

Significant alterations in arterial and venous circulation, primarily in the vascular bed of the small pelvis, were detected in patients with chronic salpingo-oophoritis (Evseeva et al., 2006). Chronic PID refers to both residue of acute and sub-acute recurrence of a previous infection or/and as a result of late detection of and intervention for upper tract pelvic infection. Chronic PID presents a diagnostic and management challenge to healthcare providers (Kottamann, 1995). The aim of PID management is to alleviate pain and systemic malaise associated with infection, to achieve microbiological cure, to prevent development of permanent tubal damage with associated sequelae, such as chronic pelvic pain, ectopic pregnancy and infertility and to prevent the spread of infection to other parts. The management of pelvic inflammatory disease should be broad spectrum antibiotics. Recent treatment trials have focused on shorter duration regimens such as azithromycin and monotherapies including ofloxacin (Ross, 2001; Haggerly and Ness, 2006). Conventional chronic pain treatments included nonsteroidal anti-inflammatory drugs (NSAIDs), etaminophen, narcotics and medicinal marijuana (Roy, 1983).

It is widely claimed that shortwave diathermy (SWD) can be used to reduce pain and swelling, accelerates the anti-inflammatory process and promotes healing in tissues with chronic inflammation (Roy, 1983). The SWD is high-frequency electromagnetic waves (current is of high alternating frequency) that do not stimulate motor or sensory nerve; it is a form of radiofrequency radiation, operating at a frequency of 27.12 MHz, used therapeutically by physiotherapists (Shields et al., 2003). It is ideal for heating tissues as deeply placed in the pelvis as the female reproductive organs (Tindall, 1987). Application of SWD to the involved tissues may increase vascular circulation any changes are likely as a result of increasing tissue temperatures, which directly results in vascular dilatation, increase in pain threshold, and a decrease in pain and swelling (Hecox, 1994; Rennie and Michlovitz, 1996). Such vascular improvement also encourages resolution of the inflammatory processes by increasing nutrition, oxygen supply and by removing metabolic and waste products (Tindall, 1987; Goats, 1989) and in turn promotes natural resistance to infection (Tindall, 1987; Jan et al., 2006).

Owing to the chronic nature of the disease, large doses of analgesics, antibiotics and their side effects on the body, there is a need for a non-invasive therapeutic and symptomatic chronic pain management. However, studies investigating the efficacy of alternative to analgesics such as SWD are very few and mostly cases reports with few numbers of participants. Therefore, the primary and secondary purposes of this study were to investigate the efficacy of SWD in the symptomatic management of pain and anti-inflammatory role in chronic PID respectively.

Methodology

Design

A double blind pretest–post-test, independent group assignment design was used in data collection.

Subjects

A total of 40 subjects with diagnosis of chronic PID were referred for physiotherapy from the Obstetric and Gynaecology Department of Murtala Muhammed Specialist Hospital, Kano, Nigeria and from private gynaecologists. Patients who had stop analgesic for at least one week and those who met the inclusion criteria were selected for this study. Subjects' age ranged between 24 and 40 years.

Inclusion criteria

Clinical diagnoses of PID for more than six months history, laboratory (microbiological) examination indicating presence of pus cells.

Exclusion criteria

Acute PID and other acute genital infections, intrauterine device/implants, cardiac pacemaker, active tuberculosis, tumour, pregnancy, skin sensation defect, obesity (BMI ≤ 30 kgm−2), history of electromagnetic therapy, severely ill patients, intolerance to oral antibiotics, analgesics and electromagnetic therapy.
Procedure

Pre-treatment procedure

Informed consent was sought from patients willing to participate in accordance with the ethics of human participation by the management committee of Murtala Mohammed Specialist Hospital, Private Clinics and diagnostics’ centres where the study was conducted. Laboratory (endocervical swab) investigations indicated evidence of pus and blood cells in all subjects recruited. Pre-treatment pain index assessment was conducted by a neutral assessor (senior physiotherapist) through the visual analogue scale (VAS) (Hendiani et al., 2003; Hoof, 2007; Smith et al., 2008). It is a scale, using a 10-cm line divided into 10 equal sections, with 0 representing ‘no pain’ and 10 representing unbearable pain. Each participant was asked to indicate on the scale the level of pain in their lower abdominal and pelvic region.

Patients were randomly assigned to three groups: SWD, control and analgesic groups

Group X₁ (SWD group) antibiotics + SWD + placebo tablets (number of subjects = 13)
Group X₂ (control group) antibiotics + sham SWD + placebo tablets (number of subjects = 13)
Group X₃ (analgesic group) antibiotics + sham SWD + analgesics and (number of subjects = 14).

Following random assignment, the gynaecologists prescribed antibiotics, placebo tablets and analgesics accordingly.

Patients for SWD group were screened for all the contra-indications to SWD through the past medical and family social history. Thermal skin sensation test was carried out with two test tubes with cold and warm water. It was ascertained that sensitivity of the skin surface area of electrodes placement were intact.

Treatment procedure

Group X₁

A continuous shortwave diathermy current was generated by the Shortwave diathermy machine (Ultratherm 608, Made in Germany by Siemens) adopting the modified crossfire technique as described by Balogun and Okonofua (1988) and Lamina and Hanif (2008). This involved moving electrodes to a position at right angles to their previous position half way through treatment. In this way, half the treatment was given antero-posteriorly through the pelvis with the patients in supine lying position and second half with the patients in the side lying positions with their legs curled up and the electrodes over the pelvic outlets and the lumbo-sacral area of the spine.

Treatment intensity An intensity that generated moderate pleasant sensation of warmth (dose III) in the Kloth (1986) definitions of dosage for SWD, the present study mean ± SD treatment power was 8.27 ± 2.53 W.

Treatment frequency Treatment was given every alternative days for a total of 15 exposures (treatment sessions).

Treatment duration The treatment duration was 20 minutes (Pages, 1993); split into two sessions of 10-minutes per session in the crossfire positions.

Group X₂

Control group received sham SWD, antibiotics and placebo tablets as prescribed by their gynaecologists.

Group X₃

The analgesic group received sham SWD, antibiotics and analgesic (NSAID) prescribed by their gynaecologists.

For all the groups, the study lasted for about 30 days. Placebo tablets were mainly lactose and inert substances. Sham SWD was light hot pack wrapped with towel placed beneath the electrodes for light warmth and SWD machine was on at zero intensity. Positioning for sham SWD was as earlier described for the SWD group. Both sham SWD and SWD treatments were halted during menstrual bleeding and treatment resumed immediately after bleeding.

Medications

Antibiotics: oral ofloxacin 400 mg b.d. (twice daily) and metronidazole 400 mg b.d.
Analgesic: oral ibuprofen 400 mg b.d.

Post-treatment procedure

At the end of the 30 days treatment duration and following 5 days (1 week) of no treatment (after which they had exhausted their analgesics, placebo, sham...
SWD and SWD treatments) all subjects were assessed for the post-treatment pain score (VAS) using the same pre-treatment procedure by another neutral assessor who had no prior knowledge of the study, subjects’ records or groups. Post-treatment laboratory (endocervical swab) investigation was also conducted.

At the end of the study only 32 subjects (SWD group = 11; control group = 10; analgesic group = 11) completed the study. Eight subjects (SWD = 2; control 3; analgesic = 3) had dropped out and had incomplete data. Therefore, the data of 32 subjects were used in the statistical analysis (Figure 1). After the post treatment data, all subjects were referred back to their gynaecologists for further consultation.

Data analysis

Mean, standard deviation and percentage were computed. Chi-square, Kruskal-Wallis and Analysis of covariance (ANCOVA) was used to assess the treatment outcomes. In the ANCOVA, the post-treatment pain values (post-test values) were the outcome variables and baseline (pre-test values) pain scores as covariates. Scheffe post hoc analysis was performed to identify which means significantly differ from one another. Statistical analysis was performed on micro-computer using Statistical Package for the Social Sciences (SPSS) version 16 (Chicago, IL, USA). A probability level of 0.05 or less was used to indicate statistical significance.

Figure 1 Study design flow chat
Results

A total of 32 patients ranging in age from 24 to 40 years participated. The mean ± SD age (29.41 ± 5.48 years), weight (56.38 ± 3.26 kg), height (1.48 ± 0.07 m) and BMI (25.60 ± 2.77 kg/m²). Groups mean ± SD for the SWD (n = 11), control (n = 10) and analgesic (n = 11) groups were 28.55 ± 5.45, 30.40 ± 5.60 and 28.36 ± 5.75, respectively. There was no age difference in the groups (F = 0.351, p = 0.707) at p < 0.05.

All subjects 32 (100%) pretest laboratory result indicated the presence of pus cells. Post-test laboratory investigation indicated that nine (82%), three (30%) and four (36%) subjects in the SWD, control and analgesic groups respectively reported absence of pus cells. Chi-square test indicated significant association between treatment and resolution of chronic PID at p < 0.05 (Table 1). Kruskal Wallis test indicated significant deference (χ² = 6.658, p = 0.036) in treatment modalities and resolution of PID at p < 0.05.

Groups’ pre- and post-treatment pain index scores were compared to determine any significant difference in severity of pain perception. Groups base line (pretest) pain scores differ significantly (F = 4.962, p = 0.014) at p < 0.05. Table 2 showed the pre- and post-test mean ± SD pain level in the three groups. Table 3 (ANCOVA) showed that the difference in the severity of pain before and after treatment was statistically significant (p < 0.05) amongst groups. There was a significant reduction in the mean pain of the SWD group (X₁) over the control (X₂) and analgesics (X₃) groups as depicted in Table 4.

Discussion

The main purpose of this study was to determine the therapeutic efficacy of SWD in the management of chronic pain in PID; while the subsidiary aim was to investigate the anti-inflammatory role of SWD. The present study reported a significant effect of SWD in pain reduction over analgesic and overall adjunct anti-inflammatory role. This finding supports the work of Balogun and Okonofua (1988) who reported an effective use of SWD in the management of chronic PID. They studied the effect of shortwave diathermy (SWD) on PID pain using the 10-point ratio pain scale. They concluded that SWD may be effective in the management of pelvic infections that are unresponsive to chemotherapy. Lamina and Hanif (2008) also reported a similar finding in a case series report; they concluded that SWD may be an effective alternative to analgesic.

Another similar study that investigated an alternative therapy to analgesic was conducted by Evseeva et al. (2006). Sixty-three females with chronic salpingo-oophoritis participated, 52 patients received intensive therapy with impulse low-frequency electrostatic field (ILFEF) through abdomino-vaginal, while the remaining 11 patients were on sham. They reported that ILFEF produced marked and long-term positive effects (up to 18 months) on pain relief.

Table 1. Group posttest and resolution of inflammation in pelvic inflammatory disease (Chi square [χ²]), N = 32

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pus cells</th>
<th>No pus cells</th>
<th>χ² value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short wave diathermy</td>
<td>2 (18.2)</td>
<td>9 (81.8)</td>
<td>6.873</td>
<td>0.032*</td>
</tr>
<tr>
<td>Control</td>
<td>7 (70)</td>
<td>3 (30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analgesic</td>
<td>7 (63.6)</td>
<td>4 (36.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at p < 0.05.

Table 2. Mean and standard deviation of pain level in the 3 groups (N = 32)

<table>
<thead>
<tr>
<th>Variables</th>
<th>SWD group (n = 11)</th>
<th>Control group (n = 10)</th>
<th>Analgesic group (n = 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X ± SD</td>
<td>X ± SD</td>
<td>X ± SD</td>
</tr>
<tr>
<td>Pretest pain</td>
<td>5.09 ± 0.83</td>
<td>5.90 ± 0.74</td>
<td>6.00 ± 0.63</td>
</tr>
<tr>
<td>Posttest pain</td>
<td>0.55 ± 0.52</td>
<td>3.60 ± 0.97</td>
<td>2.27 ± 1.35</td>
</tr>
</tbody>
</table>

Table 3. ANCOVA summary for groups pain level (N = 32)

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>42.83</td>
<td>2</td>
<td>21.414</td>
<td>20.626</td>
<td>0.000*</td>
</tr>
<tr>
<td>Within group</td>
<td>29.07</td>
<td>28</td>
<td>1.038</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>219.00</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at p < 0.05.

Table 4. Scheffe’s (groups mean difference) value

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean difference (I–J)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X₁–X₂</td>
<td>3.154*</td>
</tr>
<tr>
<td>X₁–X₃</td>
<td>1.839*</td>
</tr>
<tr>
<td>X₂–X₃</td>
<td>1.315*</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05.
A case study was conducted by Vance et al. (1996) though not infectious condition but a similar painful symptom. The study investigated the therapeutic efficacy of non-invasive alternative to analgesics in female condition (dysmenorrhoea). The case report documented the use of microwave diathermy on a 31-year-old woman who had had primary dysmenorrhoeal since menarche began at age 13 years, for 18 years. Microwave diathermy (45 W total power) was administered for 20 minutes each month on the day symptoms began (usually the first day of menstruation) over seven-month interval, diathermy was followed by almost-immediate and long-lasting relief of symptoms. They concluded that microwave diathermy may be an effective treatment for dysmenorrhoea. Wang et al. (2006) in their own study investigated the effect of ultra-laser therapy in the management of chronic PID. Sixty cases of chronic PID were divided into a treatment group and a control group, 30 cases in each group. The treatment group were treated with point injection of Yuxingcao Injectio combined with ultra-laser point radiation, and the control group with simple point injection of Yuxingcao Injectio, once each day, for four weeks. They reported that twenty-eight cases were effective with a total effective rate of 93.3% in the treatment group, and 23 cases were effective with a total effective rate of 76.7%; the weighty pain of lower abdomen, abnormal leucorrhea and signs of gynaecological examination in the treatment group significantly improved as compared with the control group. They concluded that point injection combined with ultra-laser radiation has definite therapeutic effect on chronic pelvic inflammatory disease.

The favourable symptomatic pain and adjunct anti-inflammatory effect of SWD in the management of PID as reported in the present study could be associated with the effect of SWD in dilatation of arterioles and capillaries that result in an increased flow of blood to the pelvic region, the dilatation of capillaries also increases the exudation of fluid into the tissues followed by increased absorption these assist in the removal of waste products. These effects also help to bring about the resolution of inflammation (Goats, 1989; Rennie and Michlovitz, 1996; Haggerly and Ness, 2006; Jan et al., 2006). Chronic PID is associated with chronic pelvic pain as a result of inflammatory processes in the pelvis (EAU, 2007). Resolution of the inflammation is accompanied by relief of pain. Furthermore, increased blood flow caused by heating the uterus may have facilitated ‘washout’ of the prostaglandins, which also have been implicated in promoting inflammation and causing pain (Vance et al., 1996; EAU, 2007). However, there is no better way of eliminating pain than by removing its cause. With any symptomatic therapy, however, efficacy must be weighed with the risks involved. SWD has the advantages over analgesic in the sense that it is non-invasive, non-addictive and causes no known major side effects provided the contraindications are avoided.

**Conclusion and practical application**

The study revealed therapeutic efficacy of SWD in the symptomatic management of chronic pain and as an adjunct anti-inflammatory therapy in chronic PID. However, due to the small sample size, some improvements may have been seen anyway with antibiotics, although the SWD group appears to improve more. This factor warrants more attention in future studies. Also, studies are needed to objectively investigate the anti-inflammatory effect and quality of life with SWD in the management of chronic PID.

**REFERENCES**


