

Pain relief after inguinal herniorrhaphy. Ineffectiveness of pulsed electromagnetic energy

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Summary

A double-blind randomised controlled trial was performed to study the analgesic effect of pulsed electromagnetic energy on pain after elective inguinal herniorrhaphy. Using a portable machine, treatment was given for 15 minutes twice daily. Pain was assessed by linear analogue scales at 24 and 48 hours post-operatively. No significant analgesic effect could be detected and there was no difference in analgesic requirements in the treated and non-treated groups.

Introduction

In recent years an alternative to opiates for post-operative analgesia has been sought. These include wound perfusion with local anaesthetic agents¹ and transcutaneous nerve stimulation². These treatments may reduce opiate requirements and associated side effects, including sedation and respiratory depression³.

No single method has proved entirely satisfactory and initial enthusiasm is often dampened by further studies which fail to confirm a beneficial effect^{4,5}. Pulsed electromagnetic energy (PEME) has been reported to reduce pain after orchidopexy⁶, and soft tissue injuries⁷, and to hasten wound healing⁸.

Recently portable low energy output PEME machines have been introduced and these are suitable for the treatment of post-operative patients on the ward. There have been reports of beneficial effects on a variety of acute and chronic conditions, ranging from varicose ulceration to sprains and fractures^{9,10}. Because of these reports a double-blind randomised study was undertaken to investigate the effects of this treatment on wound pain after repair of inguinal herniae.

Patients and methods

Forty-three patients admitted consecutively for elective repair of reducible inguinal herniae

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gave informed consent and were randomised into two groups.

Two identical Therafield Beta PEME machines were used*, and one was adapted so that no electromagnetic energy was delivered to the patient (dummy machine). The machine comprised a portable mains or battery operated box with two electrode pads, one of which is placed over the area to be treated whilst the other dispersal pad is placed under the thigh. The dummy machine was adapted by the company engineer so that neither the patient nor the doctor knew if electromagnetic energy was being delivered. In addition, there is no local heating effect from this treatment, unlike other high powered machines which may produce mild heating effects at peak output (eg Diapulse, output 975 watts). Patients were treated twice daily for periods of 15 minutes. A pulse rate of 320/second, pulse width of 60 microseconds and maximum power output of one watt was used.

All the operations were undertaken using a skin crease incision, with either a Bassini or darn repair of the posterior wall of the inguinal canal using non-absorbable suture material. Skin closure was with interrupted or continuous non-absorbable sutures and a clear plastic adhesive dressing (Opsite) was applied to the wound at the end of the procedure.

No long-acting analgesic agents were given during the operation and post-operative analgesia was standardised, patients received either papavaretum (Omnopon) 10–20 mg or paracetamol 0.5–1 g four hourly if required. Pain was assessed by an independent observer, using a linear analogue scale, immediately on return to the ward and at 24 and 48 hours post-operatively. The analgesic consumption in hospital was recorded. When they were able to climb a flight of stairs, patients were discharged with a supply of thirty 0.5 g paracetamol tablets. They were advised to take one or two tablets four hourly for pain related to the wound if necessary. Patients returned to the ward one week later to have the skin sutures removed. At this time the

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Table 1. Types of hernia and methods of repair.

	Group A	Group B
Number of patients	22	21
Mean age	58.2	57.2
Indirect hernia	14	14
Direct hernia	8	7
Bassini repair	8	8
Darn repair	14	13

Table 2. Mean pain scores mm (± 1 SEM)

	Group A No treatment	Group B Treatment	p*
Immediately after operation	48.2 \pm 4.5	43.7 \pm 3.2	>0.05
24 hours after operation	30.9 \pm 3.1	26.9 \pm 3.1	>0.05
48 hours after operation	21.4 \pm 2.1	25.8 \pm 5.2	>0.05

*Mann Whitney one tailed probability test.

number of tablets consumed at home was noted and the wound was inspected by a doctor for swelling or signs of infection.

Results

The two groups were well matched for age, type of hernia (direct/indirect) and method of repair (Table 1). There was no significant difference in pain scores prior to treatment with PEME or at 24 or 48 hours later between the treatment (Group B) and non-treatment (Group A) patients, Fig 1, Table 2. In addition, there was no significant difference between the two groups in analgesic requirements (Table 3) or duration of hospital stay (Group A 47 hours, Group B 42 hours). At review one week post-operatively, there was no difference in wound swelling, erythema or discomfort and there were no wound infections.

Discussion

The aim of this trial was to see if low energy PEME relieves the pain experienced after repair of an inguinal hernia. It was hoped that this might result in a reduced requirement for opiate analgesia. Any opiate sparing would be beneficial after abdominal surgery in patients with chronic respiratory diseases who are not only at

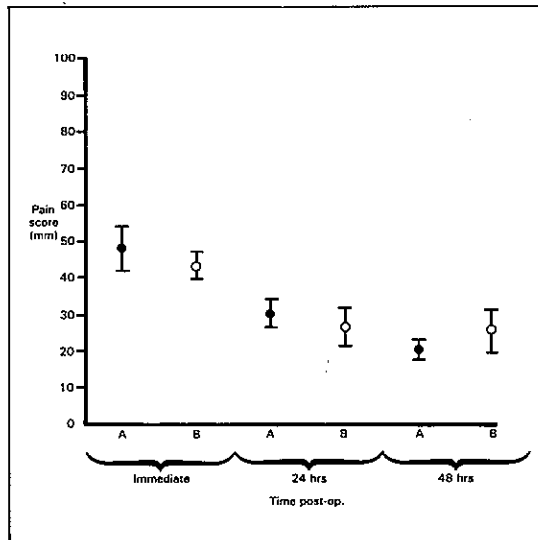


Fig 1. Mean pain scores (± 1 SEM) for Group A (Non-treatment) and Group B (Treatment) patients.

risk of respiratory depression from opiates, but also prone to respiratory complications if analgesia is inadequate.

The mechanism of interaction between magnetic fields and living tissues is poorly understood. Reported beneficial effects on damaged tissues may be due to restoration of the negative membrane potential which is deranged in injured cells¹¹.

Wilson⁷ reported beneficial effects of PEME on swelling and pain associated with inversion injuries of the ankle. Goldin *et al*⁸ showed that PEME dramatically reduced the time taken for skin graft donor sites to re-epithelialise. Both these studies, however, used equipment (Diapulse) with a high energy output (975 watts). In addition, this high output equipment does not have the advantage of being portable, preventing its use in treating patients on the ward.

This study is, to our knowledge, the first double-blind randomised study of the effect of low energy PEME on post-operative wound pain. We found no significant difference between the two groups in analgesic requirements, pain scores or complications at one week.

There are several possible reasons why this study failed to show any beneficial effect from this form of treatment. Firstly, the duration or strength of treatment may have been inadequate. However, frequency, pulse width, duration and number of treatments were compatible with those recommended by the manufacturers for the treatment of surgical

Table 3. Analgesic consumption

Analgesic	Group A No treatment	Group B Treatment	p*
Omnopon			
Number of patients	13	7	>0.05
Number of injections	13	9	>0.05
Mean dose (mg)	16	16	
Paracetamol in hospital			
Number of patients	14	10	>0.05
Mean number of tablets	5	4	
At home			
Number of patients	19	15	>0.05
Mean number of tablets	13	13	

*Chi-square with Yates' correction.

wounds. More frequent or longer periods of treatment with PEME would be less convenient and would place an unacceptable workload on the physiotherapist or ward staff.

Secondly, it may be that the pain caused by a procedure, such as an inguinal hernia repair, is beyond the range that a low output PEME machine can relieve. Thirdly, it may be that there is a beneficial effect but because of the small number of patients in the trial or the methods used to assess pain it was not detected.

Assessment of pain is notoriously difficult and linear analogue scales, although commonly used in this context, have recently been criticised due to poor reproducibility¹². There was a non-significant reduction in analgesic consumption in the treatment group. If this difference was to prove significant with a greater number of patients studied, we do not feel it is of sufficient magnitude to justify the introduction of this form of treatment.

Our results do not support the use of this form of treatment in the control of pain following inguinal herniorrhaphy, despite previous reports of an analgesic effect after various types of injury. However, none of these studies was randomised, controlled or double-blind.

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*Literature available from Duffield Medical Equipment Co, Derby, UK.

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