Effectiveness of pulsed electromagnetic field therapy in the management of osteoarthritis of the knee: a meta-analysis of randomized controlled trials

Vavken P, Arrich F, Schuhfried O, Dorotka R

CRD summary
The authors concluded that Pulsed Electromagnetic Field Therapy improved function and clinical scores of patients with osteoarthritis of the knee. Given the limitations of both the review and the included studies (particularly the limited quality assessment and small sample sizes) this conclusion should be treated with caution.

Authors' objectives
To assess the effectiveness of Pulsed Electromagnetic Field Therapy in reduction of pain, clinical scores, activities of daily living and stiffness of osteoarthritis of the knee.

To assess whether differences in effects are due to differences in treatment protocols.

Searching
PubMed, EMBASE and Cochrane Central Register of Controlled Trials (CENTRAL) were searched up to January 2008. Only papers reported in full were eligible for inclusion. No language or publication date restrictions were applied. Experts in the field were contacted for further information regarding meetings, unpublished studies and rejected papers.

Study selection
Randomised controlled trials (RCTs) that compared Pulsed Electromagnetic Field Therapy with a placebo in patients with arthritis of the knee were included. Treatment regimens varied widely across trials from 3Hz to 7.8Hz applied for 10 minutes three times a day to 27MHz pulsed applied for 20 minutes three times a day. Participants’ average age ranged between 58.1 and 73.3 years. Average body mass index was between 27.0 and 29.4. The proportion of female participants in each trial arm ranged from 20% to 91%. Review outcomes were pain assessed using a visual analogue scale, clinical scores measured with either Western Ontario and McMaster Universities Osteoarthritis Index or Arthritis Impact Measurement Scale, stiffness and activities of daily living.

It appeared that authors obtained all relevant papers and assessed against inclusion criteria in duplicate.

Assessment of study quality
A modified Jadad scale was used that attributed a point each to randomisation, blinding and description of attrition.

Data extraction
Two reviewers independently extracted data. All end points as close as possible to six weeks of follow-up were abstracted. Data were cross-checked and any disagreements were resolved through consensus. An expert in the field assessed the methods of all relevant papers for a description of Pulsed Electromagnetic Field Therapy used in each study.

Methods of synthesis
If no heterogeneity was detected for outcomes reported on the same scale, study-specific weighted mean differences (WMD) were combined using an inverse variance weighted fixed-effects model. DerSimonian and Laird random-effects models were used when heterogeneity was present. Standardised mean differences (SMD) were pooled for outcomes reported on different scales.

Heterogeneity was explored using Cochrane's Q-test and $I^2$ index. Publication bias was assessed graphically using funnel plots and Egger's regression. Sensitivity analysis was conducted to assess the impact of individual studies on the pooled estimate.
Results of the review
Nine RCTs (n=483) were included. Sample sizes ranged from 18 to 86 participants. All studies scored maximum points on the modified Jadad Scale.

Pulsed Electromagnetic Field Therapy significantly improved activities of daily living (WMD 0.80, 95% CI 0.10 to 1.40; five trials) and there was an improvement in clinical scores in patients who received classic Pulsed Electromagnetic Field Therapy (SMD 0.46, 95% CI 0.01 to 0.90; two trials) compared to the placebo. There was little evidence that Pulsed Electromagnetic Field Therapy was effective in improving pain or stiffness. Treatment effects of pain (p=0.237), clinical scores (p=0.100), activities of daily living (p=0.416) or stiffness (p=0.299) did not differ with the type of therapy (classic Pulsed Electromagnetic Field Therapy or pulsed short wave therapy). No statistically significant heterogeneity or publication bias was present.

Authors' conclusions
Pulsed Electromagnetic Field Therapy improved function and clinical scores of patients with osteoarthritis of the knee and should be considered as adjuvant therapies in their management. There was equipoise of evidence for an effect on pain in the literature at the time of the review.

CRD commentary
The research questions were clear and supported by appropriate inclusion criteria. The authors attempted to identify unpublished studies, but restricted the review to full-text papers and this meant that some relevant studies may have been missed. The authors appeared to take steps to minimise risk of errors and bias during the review process. Although study quality was assessed using the Jadad scale, this was quite limited in its scope and so even though all included studies scored maximum points, the results should be interpreted cautiously (particularly in light of the small sample sizes). Appropriate methods were used to pool the studies. Heterogeneity, publication bias and influence of individual studies were investigated; limited results were presented on these aspects.

Given limited quality assessment and small sample sizes of included studies, the authors' conclusions appear somewhat over-optimistic and should be treated with caution.

Implications of the review for practice and research
Practice: The authors stated that Pulsed Electromagnetic Field Therapy might be useful in conservative management of osteoarthritis of the knee.

Research: The authors stated that further studies were required to establish the effectiveness of Pulsed Electromagnetic Field Therapy in conservative management of osteoarthritis of the knee.

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