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Original article

An evaluation of pulsed shortwave on knee osteoarthritis using radioleucoscintigraphy: a randomised, double blind, controlled trial

Michael J. Callaghan [a,*], Paula E. Whittaker [b], Stephen Grimes [c], Linda Smith [c]

[a] *Centre for Rehabilitation Science, Manchester Royal Infirmary, Oxford Road, Manchester M13 9WL, UK*
[b] *Department of Physiotherapy, Royal Liverpool University Hospital, Prescot Street, Liverpool L7 8XP, UK*
[c] *Department of Nuclear Medicine, Royal Liverpool University Hospital, Prescot Street, Liverpool L7 8XP, UK*

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Abstract

Objective. – To evaluate the effects of pulsed shortwave on osteoarthritis of the knee.

Methods. – A double blinded, randomised, controlled trial. Thirteen female and 14 male patients with radiographic evidence of knee osteoarthritis were randomly allocated to either low dose (10 W), or high dose (20 W) or placebo high frequency pulsed shortwave. Knee radioleucoscintigraphy was performed pre and post treatment as well as objective functional and subjective evaluations.

Results. – There were no significant differences between the groups in the pre and post treatment percentage change for radioleucoscintigraphy ($P > 0.05$). Functional and subjective measures also revealed no pre and post treatment differences between the groups ($P > 0.05$), except for improved knee range of motion in the placebo group ($P < 0.05$).

Conclusion. – Joint inflammation in knee osteoarthritis, measured using radioleucoscintigraphy, was not altered significantly by pulsed shortwave, therefore this therapeutic modality has little or no anti-inflammatory effect on conditions such as osteoarthritis of the knee.

Keywords: Radionuclide imaging; Shortwave therapy; Physiotherapy; Electrotherapy

1. Introduction

Osteoarthritis (OA) is a major health problem affecting over 60% of adults in the Western world over 65 years of age, with the knee being one of the most commonly affected joints, yet it receives scant resources for clinical research [1]. The use of pulsed shortwave therapy has increased significantly since 1980 and has gained popularity as a treatment modality [2]. The rationale for its use in OA is that the on–off effect of pulsing produces non-thermal effects that might promote tissue healing and relieve pain and inflammation (for a review see [3]). There have been only three controlled trials evaluating pulsed shortwave in the treatment of OA knee; these have produced contradictory results. In the first, Klaber-Moffet et al. [4] evaluated both hip and knee OA in 92 patients and found no differences in pain, general health and activities of daily living between the active and placebo treatment groups; measures of joint inflammation were not taken. In the second, Trock et al. [5] treated 86 patients with OA knee with active or placebo pulsed shortwave. Using measures of pain, pain on motion, joint tenderness and a non validated ADL score, they found statistically significant improvements *within* both the active and placebo groups in all measures at the end of treatment. However, *between* groups analyses revealed that the active group had borderline significant differences in three outcomes and no difference in pain on passive motion. This led them to conclude that active pulsed shortwave had therapeutic benefits in OA. Measures of joint inflammation were not used in this study either. In the third study, Sewell et al. [6] attempted the more technically advanced method of thermal imaging to assess knee joint swelling in 81 patients with sero-positive rheumatoid arthritis. They reported no differences between active and placebo treatments, but as their study was only published in abstract form, full analysis of the results was not possible.

One of the potential benefits of pulsed shortwave seems to be a decrease in joint inflammation, yet efforts to assess the

* Corresponding author. Tel./fax: +44-161-276-8078.
E-mail address: michael.callaghan@man.ac.uk (M.J. Callaghan).

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degree of inflammation in an arthritic joint are difficult and rely primarily on clinical estimations of swelling and warmth that are either subjective or prone to measurement error [7]. Methods are available in the field of nuclear medicine using ^{99}technetium hexamethylpropyleneamine oxime ($^{99}Tc^{m}$—HMPAO)—labelled white blood cells (WBC) to scan knee joints of patients with rheumatoid and osteoarthritis. This enables clinicians to have quantitative measurements of the inflammatory process and a sensitive index for monitoring disease activity, thus providing an objective assessment of joint inflammation and its response to treatment. Previous studies have described how this technique is extremely useful not only in assessing chronic knee pain in a variety of pathologies including OA [8], but in detecting even a low-grade inflammatory component in OA knee [9]. Furthermore, the technique can be used to assess anti-inflammatory therapy. The purpose of this study was to employ established radioleucoscintigraphy techniques to evaluate objectively the effect of pulsed shortwave on the inflammatory component of OA knees. To our knowledge this is the first study to use this technique to evaluate this form of electrotherapy.

2. Methods

The study design was approved by the Ethics Committee and the Administration of Radioactive Substances Advisory Committee (ARSAC) of the institution where the study took place. Fig. 1 outlines the study.

Thirty two patients with primary generalised OA and a diagnosis of OA knee consented to enter the study from the Department of Orthopaedic Surgery. Radiographs were used as a benchmark for diagnosis due to the problems of predicting OA by using clinical variables alone [10]. Radiographs were assessed by the same orthopaedic surgeon throughout the entire study who classified them into graded categories of OA according to Kellgren and Lawrence [11]. Exclusion criteria were grades 0 (none) and 1 (doubtful) and 2 (minimal) radiographic categories, a diagnosis of inflammatory joint disease (confirmed by blood tests), or an intraarticular corticosteroid injection in any joint 8 weeks prior to the first scan that may suppress the classic features of inflammation [12]. Those patients with grades 3 (moderate) and 4 (severe) were included in order to make radiographic classification easier and to enable pulsed shortwave to have as large a treatment effect as possible. Informed consent was obtained from each patient.

Patients were asked to maintain their normal activity level 1 week prior to the first scan and to remain on their normal medication for the duration of the study. All patients from the placebo group were offered active treatment at the end of the study.

2.1. Sample size calculations

Calculations were performed in order to ascertain the number of patients needed to see statistically significant differences between the three groups. As there were no previous published data for radioleucoscintigraphy, data were taken for the subsidiary analyses from a previous study on patients with OA knee [13]. Based on the pain outcome with a visual analog scale VAS, with an alpha level at 0.05 and 95% power, 10 patients would be needed in each group.

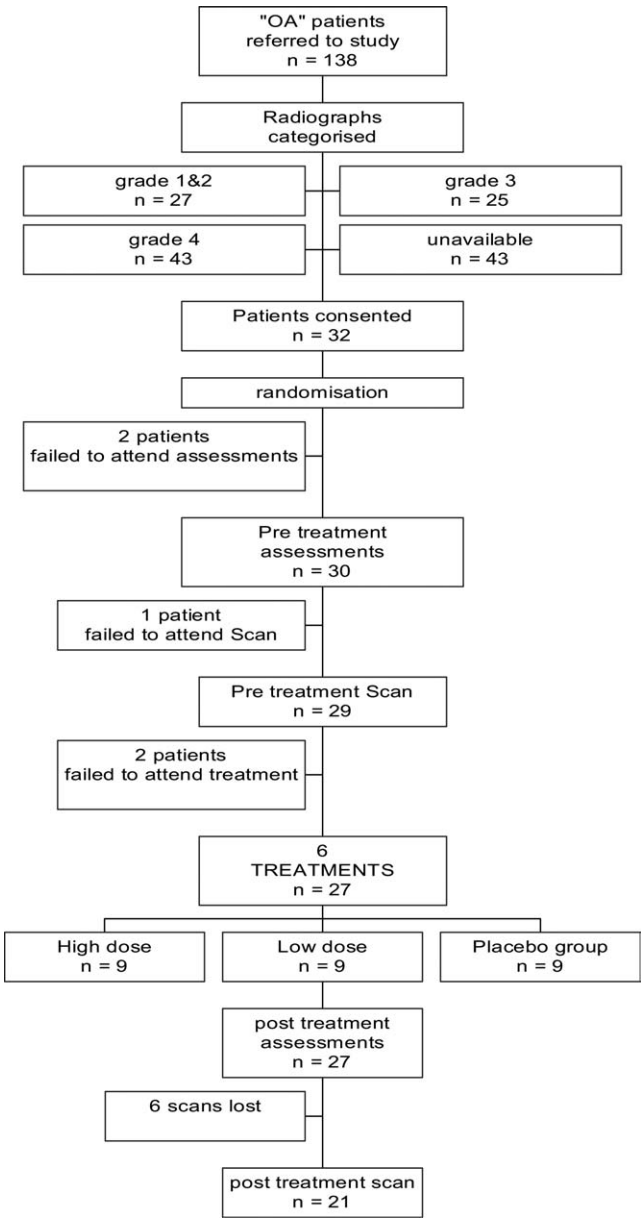

Fig. 1. CONSORT diagram.

2.2. Functional measurements

Before commencing the study each patient was assessed by an assessor (MJC) blinded to the treatment group allocation. Post treatment assessment was performed within 5 days of completing the study.