

## Brief paper

# Chronic lateral humeral epicondylitis - A double-blind controlled assessment of pulsed electromagnetic field therapy

M.D. DEVEREAUX, B.L. HAZLEMAN, P. PAGE THOMAS

*Rheumatology Research Unit, Addenbrooke's Hospital, Hills Road, Cambridge, England, CB2 2QQ.*

**ABSTRACT.** *Pulsed electromagnetic fields (PEMF) have been shown to be beneficial in the treatment of rotator cuff tendinitis. As lateral humeral epicondylitis (tennis elbow) is a similar chronic tendon lesion, 30 patients with both clinical and thermographic evidence of tennis elbow were randomly allocated to receive either active or inactive PEMF therapy. Treatment was continued for a minimum period of eight weeks. At this time there was no statistical difference between the two groups.*

*Key words:* humeral epicondylitis, pulsed electromagnetic field, treatment.

## Introduction

Lateral humeral epicondylitis (tennis elbow) is often associated with prolonged disability (1). There have been many recommendations for conservative and surgical treatment. These have included ultrasound (2, 3), short wave diathermy (4), acupuncture (5), immobilisation (6, 7), local steroid injections (8), and various surgical procedures (9, 10).

Tennis elbow usually occurs spontaneously as an over-exertion of the finger or wrist extensors (7). This can be related to occupation or sport. Cyriax (11) postulated a tear of the extensor tendon from the lateral epicondyle with a subsequent periostitis.

Coonrad and Hooper (10) have demonstrated macroscopic and microscopic tears in patients requiring surgery, and also immature fibroblastic and vascular infiltration (9). The tendon insertion is relatively avascular and the poor healing is possibly related to local ischaemia.

A significant benefit has been demonstrated in a double-blind study of pulsed electromagnetic field (PEMF) therapy used in the treatment of persistent rotator cuff tendinitis (12). Since there are some similarities in the pathological changes this double-blind study was undertaken to assess the benefit of PEMF therapy in the treatment of chronic lateral humeral epicondylitis.

## Patients and Methods

### Patients

Thirty patients suffering from lateral epicondylitis of at least three months' duration were included in the study. All had a positive thermographic pattern with a hot area near the lateral epicondyle (13). Patients with local arthritis

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M.D. Devereaux MB,BS, FRACP, Consultant Rheumatologist; B.L. Hazleman MA, MB, FRCP, Consultant Rheumatologist; P. Page Thomas MB,BS, FRCPath., Honorary Consultant Rheumatologist.

Address reprint requests to: Dr. B. Hazleman, Department of Rheumatology, Addenbrooke's Hospital, Hills Road, Cambridge, England, CB2 2QQ.

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of the elbow (clinical or radiological) generalised polyarthritis, or neurological abnormality in the affected arm were excluded, as were patients who had had an injection of steroid or local therapy in the previous month. Patients with non-closure of epiphyses, pregnancy and demand-type cardiac pacemakers were also not recruited.

#### Study design

Patients were randomly allocated to the treatment group (A) or the control group (B). Group A received active coils and Group B patients received dummy coils. Neither patient nor medical assessor was aware of the treatment group. Treatment was continued for a minimum period of eight weeks after which it could be discontinued in the absence of benefit. The code was broken after all patients had completed twelve weeks of review. Patients were reviewed fortnightly while receiving treatment.

#### Clinical assessment

At each visit clinical assessments included: (i) noting pain (0-3) induced by lifting or twisting (0 = no pain, 1 = pain on either lifting or twisting, 2 = pain on both lifting and twisting); (ii) a weight test (0-4) to assess ability to lift weights of 4, 2, 1 and 1/2 lb with elbow extended and forearm pronated; (iii) noting pain (0-3) induced by resisted wrist dorsiflexion (0 = no pain, 1 = full movement possible but slight/moderate pain, 2 = movement possible but marked pain, 3 = pain prevents any degree of resisted movement); (iv) effect on work (0-3) (0 = none, 1 = need to protect arm, 2 = pain limits use, 3 = time lost); (v) determining a pain score experienced in routine daily tasks using a 10 cm horizontal analogue scale; (vi) assessing tenderness over the lateral epicondyle using a 10 cm horizontal analogue scale; (vii) a test of grip strength using a sphygmomanometer with a cuff inflated to 30 mm Hg. An average of three estimates were taken and recording made with the elbow both flexed and extended; (viii) the thermal gradient, across the 'hot spot' found in the abnormal elbow, was measured as previously described (13).

#### PEMF regime

A single coil 18 cms diameter consisting of 32 turns of 16 gauge copper wire was used. This was first twisted into a 'figure of eight shape' and then bent around into a semi-circle to encompass the patient's elbow joint. The circular regions were applied over the medial and lateral humeral epicondyles with the centre over the olecranon. A velcro strap fastened across the cubital fossa held it in place. Patients were instructed to use the coil for at least 8 hours a day in one or two treatment sessions. No treatment session was to be less than one hour. The coils were supplied with pulse generators producing a single pulse of 200 microseconds duration with a repetition rate of 15 Hz. The signal amplitude was monitored at the centre of the coil and set to give 13.5 mV as measured with a standard search coil.

#### Statistical analysis

The rate of recovery of each clinical variable in the two groups from time 0 to each follow-up visit was compared by the use of the Wilcoxon Rank Sum Test.

## Results

Thirty patients fulfilled the criteria for the study. Fifteen entered each treatment group. There were no significant differences between the two groups (Table I). Five patients related the onset of their symptoms

Table I.

	PATIENTS DETAILS	
	Active	Placebo
Number of patients	15	15
Sex (Male:Female)	11:4	6:9
Mean age (years $\pm$ S.E.)	43.7 $\pm$ 2.0	43.9 $\pm$ 2.5
Duration of symptoms at commencement of therapy (mean months $\pm$ S.E.)	10.1 $\pm$ 1.8	9.8 $\pm$ 2.1
Number of local steroid injections (mean $\pm$ S.E.)	1.9 $\pm$ 0.32	1.46 $\pm$ 0.4
Dominant:non-dominant arm	13:2	10:5

to an injury, 2 to sporting activities, 12 to occupation, 1 to housework and 10 were unsure of any specific precipitating factor. Nineteen patients considered their pain to be gradually worsening, 7 intermittently worsening, and 4 unchanged from the onset. All had noticed a weakness in hand grip with pain exacerbated by lifting and twisting. Nineteen patients were involved in manual occupations, 10 other occupations which required repeated arm usage and 1 was a housewife.

There was no significant difference, for all assessments, between the active and inactive groups except at six weeks: grip strength in extension ( $p < 0.05$ ) and in flexion ( $p < 0.05$ ). Eight patients in each group had full recovery while 7 failed to respond and required surgery, injection and ultrasound.

The measurement of grip strength (Figs. 1 and 2) and thermography (Fig. 3) show continued improvement up to 8 weeks. This was greater in the PEMF treated group but did not reach statistical significance.

Duration of therapy with PEMF, occupation, sex, arm dominance, duration of symptoms prior to treatment and number of preceding injections did not appear to have any influence on the outcome. There were no side effects reported during the study that could have been attributable to the PEMF therapy.

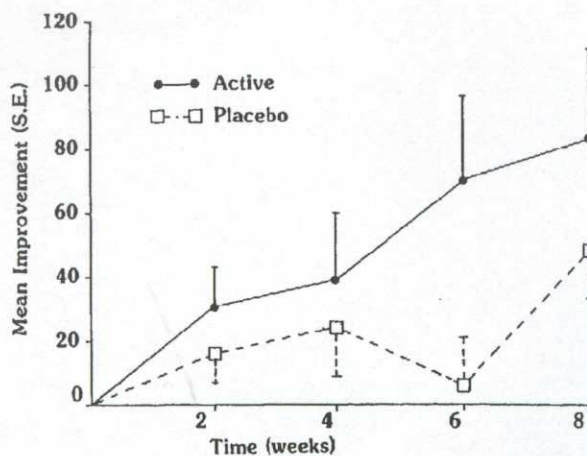


Fig. 1 - Mean improvement in grip strength (in flexion) from time 0 in 30 patients treated with PEMF or placebo.

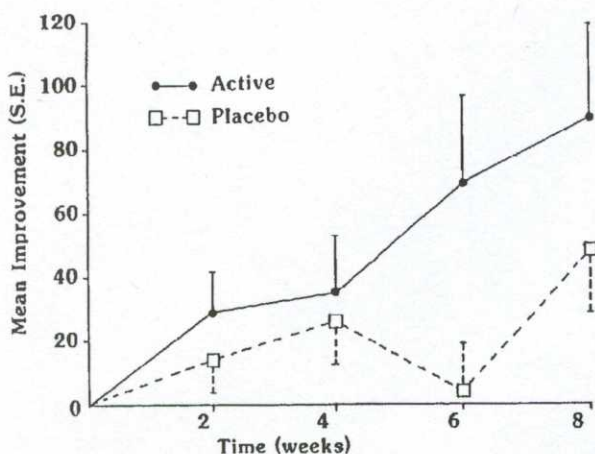


Fig. 2 - Mean improvement in grip strength (in extension) from time 0 in 30 patients treated with PEMF or placebo.

All patients managed to use the coils at night with reasonable comfort. The mean time of use in the active group was 6.7 hours (range 3-12 hours) and in the placebo group 6.3 hours (range 3-12 hours).

## Discussion

In chronic lateral humeral epicondylitis we have been unable to show an advantage with pulse electromagnetic field therapy. The spontaneous healing in 53% of the patients on inactive coils was much higher than expected. In a previous study of 76 acute tennis elbows (3) treated in a double-blind manner with ultrasound there had been only a 29% response from inactive ultrasound compared to a 63%

response from active ultrasound. This present study demonstrates the necessity of a placebo group in studies of physical therapy.

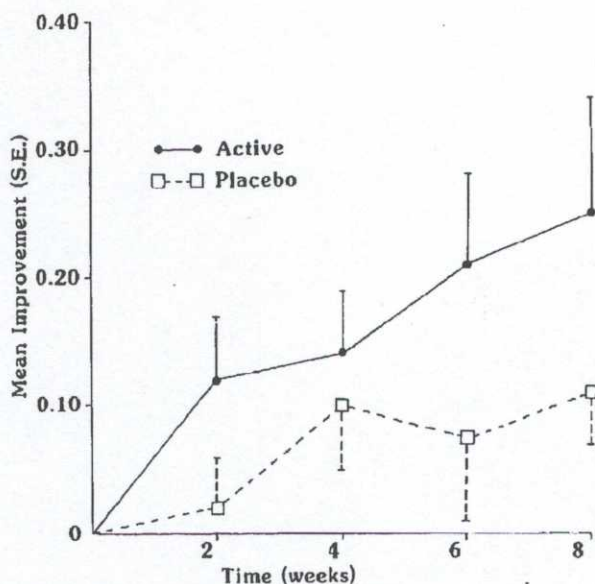


Fig. 3 - Mean improvement in thermographic gradient from time 0 in 30 patients treated with PEMF or placebo.

The differential diagnosis of lateral epicondylitis includes an entrapment syndrome of the posterior interosseus nerve (14). Thermography can differentiate between tennis elbow and an entrapment syndrome (15). As in tennis elbow there is a discrete localised area of increased heat near the lateral epicondyle. The thermal gradient slope across the abnormal lateral epicondyle has been shown to correlate with clinical state and reflect recovery (13).

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