British Journal of Rheumatology 1993;**32**:740–742

laser RCT tendinitis

A DOUBLE-BLIND STUDY OF THE EFFECTIVENESS OF LOW LEVEL LASER TREATMENT OF ROTATOR CUFF TENDINITIS

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SUMMARY

Thirty-five patients with rotator cuff tendinitis were randomly allocated to active (CB Medico Master III 830 nm Ga As AL diode) laser or dummy laser treatment twice weekly for 8 weeks. Movement range, painful arc score, resisted movement score and responses to visual analogue scales for night pain, rest pain, movement pain and functional limitation were measured second weekly. All responses improved from baseline but there was no difference between the two groups. These results fail to demonstrate the effectiveness of laser therapy in rotator cuff tendinitis.

KEY WORDS: Rotator cuff tendinitis, Laser, Treatment.

ROTATOR cuff tendinitis (RCT) is a common disorder affecting individuals subjecting their shoulders to repeated stress, athletes and many middle-aged and elderly persons in whom a cause may not be apparent [1]. Small degenerative lesions and traumatic tears in the tendons of the rotator cuff are believed to incite an inflammatory response with subsequent pain, stiffness and limitation of shoulder movement [2].

Many treatments are variably effective in this condition. Low level laser therapy (LLLT) has been reported to be beneficial in soft tissue and rotator cuff lesions [3]. We prospectively studied 35 patients to evaluate the usefulness of this laser therapy in comparison to placebo in the treatment of rotator cuff lesions.

PATIENTS AND METHODS

Consenting patients were drawn from outpatient rheumatology clinics of Addenbrooke's Hospital, Cambridge. Current NSAID therapy was ceased and a 1 week washout was allowed before baseline assessment. Paracetamol was allowed as an analgesic to a limit of 2 g per day. Patients had typical rotator cuff tendinitis (criteria of Cyriax [4]) with a painful arc of abduction between 40–120° and painful resisted movement in at least one of abduction, external or internal rotation. Patients with frozen shoulder, acromioclavicular arthritis or clinical rotator cuff tears were excluded, as were those patients who were pregnant or breast feeding or who had received intra-articular or subacromial steroids in the 3 months prior to treatment. Patients who had systemic disease such as an inflammatory arthropathy or who had received physiotherapy for their shoulder lesion were likewise excluded.

Assessments at baseline (and subsequently) recorded movement range (using a spirit-level goniometer), scoring of the painful arc on abduction (0, no pain; 1, catching at 1 point; 2, painful arc; 3, unable to actively overcome painful arc), pain on resisted abduction (0, no pain; 1, mild pain, full power; 2, moderate pain, reduced power and 3, severe pain), and responses to 10 cm horizontal visual analogue scales for pain at night, rest and movement and functional limitation of daily activities (0, no pain or full function; 10, severe pain, severely limited function).

Patients were randomized to treatment with a CB Medico Master III hand held single probe, continuous irradation laser (specifications given in Table I) or dummy laser in a double-blind fashion and received twice weekly treatment for 8 weeks. Each treatment lasted 10 min. Each session consisted of three pulses (3 J) to each of a maximum of five tender points found on clinical examination. As far as possible, treatment was concentrated in the subacromial and anterior shoulder regions. The laser was held perpendicular to the body surface in skin contact without pressure. The laser was calibrated regularly according to the manufacturer's instructions. The treatment parameters used including the wavelength of 830 nm were based on guidelines for dosage previously used by a Scandinavian group which has used laser therapy in the treatment of supraspinatus tendinitis [5]. One physiotherapist set up the appropriate probe (active or placebo) whilst the second 'blinded' physiotherapist administered treatment. Patients were assessed by another observer unaware of the treatment code every second week until the eighth week. On their initial visit for treatment, patients were instructed with their exercises of pendular swinging in flexion and extension, abduction and adduction. Patients were also asked to stand facing a wall with both hands placed on the wall and shoulder elevation gradually increased bilaterally (wall climbing exercises). On their second visit, patients were asked to repeat the exercises as shown previously to determine whether or not the patient had

Submitted 4 February: revised version accepted 26 June 1992.
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0263–7103/93/080740 + 03 $08.00/0

TABLE I
SPECIFICATIONS OF LOW LEVEL LASER THERAPY USED

CB Medico Master III hand held single proble laser
Laser diode: Gallium aluminium arsenide
Laser class: 3B
Wavelength of laser beam: 830 nm
Mean power of beam: 30 MW
Programmed energy quantity per laser probe activation: 1 J
Wavelength divergence: ± 1.5 nm
Beam diameter: 3 mm

performed them correctly and if not they were reinstructed. One physiotherapist treated all the patients and issued them with the same instructions. This study was approved by the Cambridge Health Authority Ethical Committee. Patients who remained symptomatic were offered alternative treatment.

STATISTICS

The Mann–Whitney test was used to compare the two groups at baseline and the means of the changes in measured parameters from baseline at 2, 4 and 8 weeks (treatment end-point).

RESULTS

The mean age of the patients was 54.4 yr (range 17–77 yr) with a mean pain duration of 14.9 months (range 4–48 months). Nineteen patients received laser therapy (eight male) and 16 patients (two male) received dummy laser. Both groups had similar baseline characteristics with respect to age, symptom duration, movement range, painful arc and resisted movement scores and visual analogue scale responses to pain and functional limitation. Both groups of patients improved substantially in all measured parameters from baseline, with the responses to laser being consistently better than those to dummy laser (Table II). However at no time was the perceived difference found to be significantly different. No complications were reported during the study although it was not uncommon for some patients to experience mild to moderate discomfort during the treatment.

DISCUSSION

Laser therapy is becoming increasingly popular amongst patients, therapists and medical practitioners for the treatment of acute and chronic musculoskeletal pain syndromes [5–8]. There are reports of useful pain relief [9,10] amongst growing evidence of a significant placebo action [7,11,12], although these studies vary in the specifications of the laser and treatment frequency. It is recognized that there are many different machines emitting laser light, different laser mediums, frequencies and energy densities [6] which are all likely to exert different effects on the same condition and our findings must be interpreted against this background.

The beneficial effect of laser on human tissue is incompletely understood and is the focus of continuing research [13]. Simply, it is a high-intensity, single-frequency beam of highly amplified coherent light formed from photons omitted by atoms falling from higher to lower energy states. Lasers used in rheumatology do not have the thermal effects of those used in surgery [14,15].

In vitro experimental evidence indicates the enhanced healing effect may be due to increased cell proliferation [16,17], although not all agree that this effect is any more than that seen in controls [18]. There are also reports of restoration of skin resistance over trigger points from abnormally low levels to that of the surrounding skin after application of laser [8,19] and that this results in symptom relief.

The usefulness of laser in tendinopathies of the upper limb has only been subjected to limited study. Lundeberg *et al.* [15] found there was no beneficial effect on tennis elbow after 10 treatments over 5 weeks. Similarly, Siebert *et al.* [20] failed to demonstrate any beneficial effect of laser over placebo in a heterogeneous group of 'tendinopathies' using a different protocol of daily treatment for 10 days. However, England *et al.* [3] reported favourably on the beneficial effect of laser in supraspinatus and bicipital tendinitis using only six treatments over 2 weeks. They considered both conditions to be comparable which may affect their results. Also, their patients had a much shorter duration of symptoms than our group (3 *vs* 15 months).

Our study, although with small patient numbers, demonstrated improvement in all measured parameters from subjective pain scores to measured range of movement. There was no significant difference between the placebo and laser groups at any time point, suggesting laser is no better than a standard

TABLE II
MEAN BASELINE AND MEAN CHANGES FROM BASELINE PARAMETERS

	Laser	Dummy laser	*P*
Movement range*			
0 wk	2.2 (0.3)	2.3 (0.4)	0.81
0–4 wks	−0.8 (0.3)	−0.5 (0.3)	0.44
0–8 wks	−1.5 (0.3)	−0.8 (0.5)	0.23
Painful arc score			
0 wk	2.4 (0.2)	2.4 (0.3)	0.91
0–4 wks	0.5 (0.2)	0.5 (0.3)	0.78
0–8 wks	0.93 (0.34)	0.64 (0.31)	0.44
Resisted movement score			
0 wk	2.1 (0.2)	1.8 (0.2)	0.3
0–4 wks	0.64 (0.18)	0.29 (0.44)	0.47
0–8 wks	0.71 (0.24)	0.18 (0.30)	0.29
VAS night pain			
0 wk	6.9 (0.5)	5.3 (0.7)	0.09
0–4 wks	3.4 (0.8)	2.1 (0.9)	0.21
0–8 wks	4.4 (0.9)	3.2 (1.2)	0.50
VAS rest pain			
0 wk	6 (0.6)	4.1 (0.8)	0.08
0–4 wks	2.2 (0.6)	1.4 (0.6)	0.33
0–8 wks	3.9 (0.7)	2.2 (1.0)	0.30
VAS movement pain			
0 wk	6.2 (0.6)	4.9 (0.7)	0.14
0–4 wks	2.7 (0.8)	1.2 (1.0)	0.24
0–8 wks	3.6 (0.9)	1.8 (1.2)	0.34
VAS functional limitation			
0 wk	6.5 (0.6)	5.7 (0.6)	0.34
0–4 wks	2.9 (0.6)	2 (0.8)	0.36
0–8 wks	3.6 (0.9)	2.9 (1.1)	0.7

*Multiply by 36 = degrees of movement.
†VAS, visual analogue score. ( ) = standard error of mean; 0 week = baseline.

exercise regimen or spontaneous improvement in RCT. The *P* values in some parameters did decrease with time when comparing successive movement range and painful arc scores with baseline, but did not approach significance. Thus increasing the number of patients studied may have increased the trend towards statistical significance but would not have been of clinical importance.

Most laser protocols treat tender points rather than defined anatomical sites. Personal experience with patients with RCT indicates that it is common for patients to experience pain or discomfort at various points over the shoulder and scapula that change over time and that have no relevance to their dominant diagnosis. Perhaps focusing treatment on these tender points avoids laser contact with the symptomatic rotator cuff as not all patients with RCT have subacromial tenderness, the anatomical site which theoretically gives best access to the rotator cuff tendons.

We conclude standard low level laser therapy is no better than placebo in treatment of RCT.

ACKNOWLEDGEMENTS

We would like to thank CB Medico for the use of their laser equipment in this study.

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