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# Soft-laser Therapy of Rheumatoid Arthritis

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The effect of soft-laser therapy on rheumatoid arthritis was evaluated in 17 patients with symmetrical involvement of the metacarpophalangeal joint of the index. Nine treatments with a He-Ne laser, 6 J/cm$^2$, were given on the one hand with a sham irradiation of the other. The study was double-blind. The laser therapy gave some pain relief, but no difference in morning stiffness or joint performance was obtained. It is concluded that the laser therapy is of limited value in rheumatoid arthritis.

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In rheumatoid arthritis (RA) the only controlled study published of laser therapy found a significant effect of a Q-switch Neodynium laser therapy (2). This irradiation is pulsatile, with a very high-output radiance in the ultraviolet spectrum at 1060 nm, and it is potentially dangerous to the eye-sight (1). Therefore, the therapy must be applied under very strict security measures.

In contrast, the so-called soft-lasers with a continuous low energy output are relatively safe to use, and this therapy has been claimed to be biostimulatory (5) and to have an effect on several medical diseases including rheumatoid arthritis (3, 7). We have investigated the effect of 633 nm He-Ne soft-laser therapy in RA in a double-blind placebo controlled study with the patient acting as his/her own control.

## MATERIALS AND METHODS

### *Patients*

Out-patients at our clinic were invited to participate in the study if they had active RA and symmetrical involvement of the metacarpophalangeal (MP) joint of the index. Four patients with definite and 14 with classical RA accepted the invitation. Fifteen were female, age median was 57 years (41–79 years), and median duration of RA was 10 years (1–21 years). Eleven were in functional class II and 7 in class III. No change in other therapy was accepted during the study. One patient withdrew because of facial erysipelas, while the remaining 17 concluded both treatment and observation period.

### *Protocol*

The patients were randomized to therapy on the MP joint of the right and left index with laser or placebo. Therapy was given on 3 alternate days a week for 3 consecutive weeks, followed by an observation time of 4 weeks.

### *Therapy*

Two outwardly identical apparatuses were obtained:

1) A type C biotronic laser giving continuous He-Ne laser irradiation at 633 nm, 10 mW, through an optic fibre conductor (Ø 1.5 mm) ending in a pen.
2) A placebo apparatus containing a red 12 V, 10 W bulb and a reflecting mirror giving as far as possible the same red light through an identical optic fibre and pen.

The laser/placebo irradiation was given by two physiotherapists simultaneously to right and left hand respectively for 5 min, during which time the pen was held at right angles in close contact with the skin and moved slowly in a semi-circle back and forth over the joint line. With an estimated area of irradiation of 0.5 cm$^2$, the effect was 6 J/cm$^2$ per treatment. During treatment, all present wore protective glasses and the door was locked from the inside. The laser/placebo code was only broken after the study.

Table I. *Evaluation of the metacarpophalangeal joit (joint ability score)*

| Grade | Flexion (tip–palm distance in cm) | Hyperextension from flat support | Finger spread |
|---|---|---|---|
| 0 | 90° | 3 cm | >5 cm |
| 1 | 0 cm | 0–3 cm | >4 cm |
| 2 | 3 cm | 0 cm | >2 cm |
| 3 | 6 cm | 0 cm | >2 cm |
| 4 | 7 cm | 0 cm | – |
| 5 | No movement in joint. | | |

*Evaluation of treatment*

The same observer evaluated the same joint on all occasions, using the joint ability score as given in Table I. Each day before, during, and 4 weeks after therapy the patients estimated for right and left index separately: 1) pain by a visual analogue scale (VAS), 2) duration of morning stiffness (MS), and 3) other effects of the treatment.

*Ethical considerations*

The study was approved by the local ethical committee. Informed consent was obtained from all patients.

*Statistical methods*

For the change in joint ability score a paired *t*-test was used and for changes in VAS and MS the sign test was applied. The level of significance chosen was at 0.05. Interindividual variation was eliminated by the patient acting as his/her own control, and the number of patients necessary for an *a priori* chosen minimal relevant laser/placebo difference of 20% (one grade in joint ability score) calculated to 13.

## RESULTS

The joint ability score showed a tendency to amelioration in both laser- and placebo-treated joints, although this difference did not reach statistical significance.

All the patients completed the questionnaire with regard to VAS. There was no differ-

Table II. *Changes in pain assessment by visual analogue scales (VAS) and morning stiffness (MS) during treatment of RA with soft-laser/placebo*

| | + | – | 0 | not done |
|---|---|---|---|---|
| VAS | | | | |
| After 1 week of treatment | 2 | 2 | 13 | – |
| After 2 weeks of treatment | 4 | 2 | 11 | – |
| After 3 weeks of treatment | 6* | 0 | 11 | – |
| After an observation of 1 month | 5 | 0 | 12 | – |
| MS | | | | |
| After 1 week of treatment | 1 | 1 | 9 | 6 |
| After 2 weeks of treatment | 4 | 0 | 7 | 6 |
| After 3 weeks of treatment | 4 | 1 | 6 | 6 |
| After an observation of 1 month | 4 | 0 | 7 | 6 |

* $p<0.05$, +: laser treatment better than placebo, –: placebo-treatment better than laser, 0: similar or no changes on both sides.

ence between the two sides before treatment, and though during therapy an amelioration was noted for both, this was more expressed on the laser-treated side (Table II). Although the morning stiffness tended towards a shorter duration during therapy, no significant effects were recorded (Table II). No changes in laboratory tests (sedimentation rate, hemoglobin, leukocyte and platelet counts) were seen, and no differences in these parameters were found between responders and non-responders to treatment.

Adverse effects were noted in 3 patients, who complained of a burning sensation in the irradiated joint—all on the laser-treated side. In these cases the sensation disappeared within a few hours, and none of the patients withdrew from the study. In 2 of these cases a positive development was noted in joint ability score, but not in VAS or MS, while the third patient had an amelioration in VAS, but not in the other parameters.

## DISCUSSION

This controlled double-blind study demonstrated some effect of soft-laser irradiation on pain in RA. The effect was seen in less than half of the patients, but apparently lasted at least one month after therapy in this minority.

This observation is in accordance with the experience with high-radiance laser therapy in similar patients (2). However, neither the latter nor our study could demonstrate major effects on objective variables related to performance. Thus, the aim of our study, i.e. to show an effect of one grade better performance in joint ability score, was not achieved. Laser irradiation has a demonstrable effect in vitro on both metabolism and surface charges on cells in culture, but the ultrastructure is unchanged (5). Conflicting data concerning a possible in vivo effect have been reported, e.g. on wound closure (3, 6–7), and the effect remains to be explained. The local heat and secondary change in blood flow might be of relevance, but the applied energy as in our study was very low and a specific effect on the inflammatory response cannot be ruled out (7).

According to a recent study by Kolari (4), the penetration of laser irradiation into the skin is limited to a few mm, and in consequence only very small joints can be treated with soft-lasers with any sensible theoretical background. Therefore, reports of soft-laser therapy with excellent effect, for instance on knee joints (3), must be regarded with some reservation. The laser therapy is rather time-consuming and expensive, and the conclusion of our results must be that the effect in RA is of limited value. Thus, soft-laser therapy should be restricted to RA patients with painful involvement of finger joints, when more conventional therapy has failed.

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