

## Arthritis – Rheumatoid

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### Low level light effects on inflammatory cytokine production by rheumatoid arthritis synoviocytes.

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**BACKGROUND AND OBJECTIVE:** Low level light therapy (LLLT) is being evaluated for treating chronic and acute pain associated with rheumatoid arthritis (RA) and other inflammatory diseases. The mechanisms underlying the effectiveness of LLLT for pain relief in RA are not clear. The objectives of this study were to determine whether LLLT decreased production of pro-inflammatory cytokines by cells from RA joints, and, if so, to identify cellular mechanisms. **STUDY DESIGN/MATERIALS AND METHODS:** Synoviocytes from RA patients were treated with 810 nm radiation before or after addition of tumor necrosis factor-alpha (TNF-alpha). mRNA for TNF-alpha, interleukin (IL)-1beta, IL-6, and IL-8 was measured after 30, 60, and 180 minutes using RT-PCR. Intracellular and extracellular protein levels for 12 cytokines/chemokines were measured at 4, 8, and 24 hours using multiplexed ELISA. NF-kappaB activation was detected using Western blotting to follow degradation of I-kappaBalpha and nuclear localization of the p65 subunit of NF-kappaB. **RESULTS:** Radiation at 810 nm (5 J/cm<sup>2</sup>) given before or after TNF-alpha decreases the mRNA level of TNF-alpha and IL-1beta in RA synoviocytes. This treatment using 25 J/cm<sup>2</sup> also decreases the intracellular levels of TNF-alpha, IL-1beta, and IL-8 protein but did not affect the levels of seven other cytokines/chemokines. TNF-alpha-induced activation of NF-kappaB is not altered by 810 nm radiation using 25 J/cm<sup>2</sup>. **CONCLUSIONS:** The mechanism for relieving joint pain in RA by LLLT may involve reducing the level of pro-inflammatory cytokines/chemokines produced by synoviocytes. This mechanism may be more general and underlie the beneficial effects of LLLT on other inflammatory conditions.

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### **The Effects of Laser Therapy in the Early Stages of Rheumatoid Arthritis Onset**

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## CONTENTS

### **1.PURPOSE:**

To study the effects of laser therapy, in comparison with other modality trials (NSAIDs), at the onset of (RA).

### **2.SUBJECTS and METHODS:**

In the study 59 patients were included, in the first 6 - 12 months from RA onset. The patients were divided into three groups: Group 1 (21 patients) received laser therapy; Group 2 (18 patients) was submitted to placebo laser therapy and NSAIDs medication; Group 3 (20 patients) was treated only with NSAIDs. Physical therapy was instituted in all three groups. A GaAlAs diode laser (830 nm, maximum output power 200 mW) was used. During 4 months, courses of laser therapy - once daily for 8 days, monthly - were administered to Group 1 and laser placebo Group 2. The density of energy (2 - 4 J/cm<sup>2</sup>) and frequency (5 Hz or 10 Hz) were dependent on the number and severity of pain in affected joints.

### **3.RESULTS:**

The analysis of the clinical and biological parameters at the end of treatment showed a statistical significant decrease of duration of morning stiffness of pain at rest and during movements and improved acute phase reactants. The overall efficacy rate in these studies was 86% in group 1, 50% in the placebo laser group, and 40% in group 3.

### **4.DISCUSSION and CONCLUSIONS:**

After 4 months of treatment, our investigations showed that infra-red laser therapy was able to restore function, to relieve pain and to avoid the complications of the disease or NSAIDs therapy (digestive or renal) at RA onset, being the most perspective modality of treatment.

## INTRODUCTION

Rheumatic diseases are frequently multisystematic in nature and chronic in duration. They represent the clinical manifestations of chronic inflammation of the tissues of the musculoskeletal system, blood vessels, and skin.

Rheumatoid Arthritis (RA) has a great importance for medical practice, because it is today the most frequent rheumatoid disease. Great majority of authors agree that the main therapy in RA is based on nosteroidal anti-inflammatory drugs (NSAIDs), as the first group of drugs utilised all over the World. Although very helpful in the most worrisome involve the gastrointestinal tract and kidneys.

Recent experimental and clinical studies emphasise that infrared laser rays of relatively low power density, and wavelengths which possess the greatest penetrating capacity, have a major role on the cells involved in the immune and inflammatory responses at synovial membrane level.

In the present study we have investigated the effects of laser as a non-medication therapy, comparatively with the traditional NSAIDs trials, in an attempt to reveal new pathogenic mechanisms of RA.

## MATERIALS AND METHODS

In the period 1997-1998, 59 patients were included in the study (from 19 to 62 years old), in the first 6-12 months from RA onset.

The criteria of study were the following:

**Clinical criteria:** arthritis with a 6-12 months onset, presence of inflammatory synovial fluids, contracture

of dry-joints, tenosynovitis or bursitis, regional muscular dystrophy, eventual ankylosis of joints in the morning, acute or chronic iridocyclitis, fever, myalgia. The diagnosis for RA was according to ARA criteria.

The functional indices for assessment of pain and joint inflammation were the following:

- Tumefaction of joints was evaluated on a 3-degrees scale (0 = joint without tumefaction; 1 = moderate tumefaction; 2 = severe tumefaction);
- Pain by movement of joints was evaluated on a 4-degrees scale (0 = without pain; 1 = slight pain; 2 = moderate pain; 3 = severe pain);
- Severity of movement's amplitude was evaluated on a 5-degrees scale (0 = without loss of movement; 1 = 25% limitation of movement; 2 = 50% limitation of movement; 3 = 75% limitation of movement; 4 = total loss of movement);

**Laboratory criteria:** blood indices (haemoglobina, leukocytes, platelets, serum immunoglobulins, rheumatoid factor, erythrocyte sedimentation rate [ESR] and C-reactive protein, T lymphocytes, NK cells = natural killer cells), synovial biopsy specimens and synovial fluid analysis.

**Radiological criteria:** soft tissue swelling, osteoporosis and periarticular osteopenia, cartilage narrowing, carpal and other erosions, growth changes and synovial inflammatory activity - were analysed on conventional plain films and by Magnetic Resonance Imaging (MRI).

X-rays radiographs taken in the early stages of the rheumatoid arthritis indicated no visible or minor changes, in conformity to Steinbrocker criteria. MRI, performed with a GIROSCAN T5 II, was a useful diagnostic modality at patients with painful joints. MRI - determined synovial membrane volumes were correlated with the overall histological assessment of synovial inflammatory activity.

**Other examinations:** ophtalmological examination (routine slit lamp examination); X-rays diagnosis esogastro-duodenal; fibroscopic examination; renal and hepatic functional probes. The patients were divided into 3 groups: Group 1 (21 patients) received laser therapy; Group 2 (18 patients) was submitted to placebo laser therapy and NSAIDs medication; Group 3 (20 patients) was treated only with NSAIDS.

It has been used a GaAIAs diode laser (830 nm, maximum output power 200 mW). During 4 months, courses of laser therapy - once daily for 8 days, monthly - were administered to Group 1 and laser placebo Group 2. The density of energy (2-4 J/cm<sup>2</sup>) and frequency (5 Hz or 10 Hz) were dependent on the number and severity of pain in affected joints.

The initial treatment with NSAIDS in Groups 2 and 3 was prescribed with Diclofenac, without exceeding 150 mg/day - in two doses - in the morning and in the afternoon, after meals. In the protocol of treatment were included, as adjuvant medication for the relief of severe pain: Panadeine (1 - 3 tablets/day), Mydocalm (1 - 3 tablets/day) Calcium and vitamins.

Clinical features and laboratory findings were evaluated before the treatment and after 4 months of treatment. The patients were clinically re-evaluated after one year from the beginning of the treatment. The selected parameters were analysed with Student's test.

## **RESULTS**

Analysing the 3 groups of patients diagnosed with RA under consideration, it comes out that there were no important differences as concerns the clinical and biological features at the beginning of treatment (Table 1).

Because the synovial membrane is the primary site of inflammation in joints with RA, there were performed synovial biopsies in 4 patients from Group 1; the overall historical assessment of chronic synovitis was well correlated with MRI - determined synovial membrane's aspect, being possible to exclude the knee tuberculosis. MRI presents significant advantages for non-invasive diagnosis of RA, and proved

accuracy by patients with painful knee, no visible modified X-rays radiographs and slightly increased acute phase reactants (Figure 1 ).

After 4-months trial of treatment, we noticed that 86% of the patients from Group 1 were going to respond well and to experience a favourable outcome, in comparison with 50% of the patients from Group 2, and only 40% from Group 3, respectively. By these patients, we remarked the decrease of the number of swelling joints and pain, an improved duration of morning stiffness and better preservation of joint function.

The laser radiation made possible not only the optimum treatment in pain-reduction therapy, but also get an improvement and/or a recovery of patients.

The laser therapy had a direct influence on the immune system by increasing the number of NK lymphocytes, while T lymphocytes remained qualitatively unmodified, but possibly with a better function (Table 2).

Clinical evaluation of the patients after one year enabled us to conclude about the efficacy of treatment in the three groups. The remission was achieved in the greatest percentage (76%) by the patients of Group 1, in comparison with Groups 2 and 3, which did not receive laser therapy. In all three groups there were patients with active arthritis, but the smallest percentage (10%) was obtained in Group 1, which demonstrates a greater effectiveness of laser therapy in comparison with the NSAIDs-therapy. In Groups 2 and 3, the patients have manifested adverse reaction to NSAIDs - therapy. The serious side effects were reactions cutaneous hypersensitivity, gastrointestinal reaction, renal and hepatic reactions (Table 4).

## **DISCUSSIONS**

The treatment with soft lasers that operate on mW power level has substantially reduced the systemic and local clinical symptomatology, in a very good agreement with the evolution of the biological features in the Group 1.

The influence of laser on the immune system has been evidenced in medical literature; immunological effects on leukocytes, T, B and NK-lymphocytes, macrophages and other cells result in local and systemic effects through a complex mechanism of actions, which is not yet definitively elucidated.

We proposed in figure 2, a scheme to explain our clinical and biological results of the applied laser therapy. We consider that in the early stages of RA onset, laser irradiation of synovial membrane could directly control the autoimmune mechanism by reducing the local and systemic inflammatory response (Figure 2).

MRI of the synovial membrane performed in our experiments was able to visualise the specific laser therapeutic response. The new MRI techniques can perform extremely sophisticated examinations and will monitor in the future, arthritis at its onset.

The obtained effects of laser therapy, have revealed the special quality of laser beam to interact with cells, to determine a controlled biochemical conversion of energy and to influence the cellular metabolism in RA, as is proposed in figure 3.

We present a functional diagram, which could explain the interactive laser mechanisms at membrane level and its action on the up-mentioned metabolism (Figure 4).

## **CONCLUSIONS**

Laser radiation made possible not only the optimum treatment in pain reduction therapy, but also brought an improvement and recovery of patients, demonstrating the greatest effectiveness, in comparison with NSAIDs therapy in the early stages of RA onset.

MRI of the synovial membrane performed in our experiments was able to visualize the specific laser

therapeutic response and in the future will facilitate the monitoring of arthritis at its onset.

The laser therapy had a direct influence on the immune system by controlling the number of lymphocytes and improving their function.

Even the action mechanism is very complex, the laser therapy is the most perspective method of today non-medication therapy.

## TABLES

Response of Patients with RA after 4 - Months Trial

RESPONSE	GROUP 1 (Laser)	GROUP 2 (Placebo Laser + NSAIDs)	GROUP 3 (NSAIDs)
Good	86 %	50 %	40 %
Satisfactory	14 %	33 %	35 %
Unchanged	--	17 %	25 %

Evolution of Patients with RA after 1 Year of Treatment

CLINICAL FEATURES	GROUP 1	GROUP 2	GROUP 3
Remission	76 %	44 %	35 %
Stable Arthritis	14 %	33 %	35 %
Active Arthritis	10 %	23 %	30 %

## The effect of laser therapy in complex treatment of patients with rheumatoid arthritis.

**Korolkova O M et al.**

115 patients with rheumatoid arthritis (RA) of II-III degrees were treated with basic RA medications and infrared laser. In a control group of 20 patients only basic medication was given. 10 areas of the body were irradiated daily, increasing the dose every day during a period of 8-10 days. The effectiveness of the therapy was controlled through laboratory tests on i.a. inflammatory agents and the activity of lipid peroxidation. The results were statistically significant. The best effect was found in patients with degree II RA. Steroid medication could be reduced 8-10 days earlier in this group of patients and in some cases the medication could even be excluded. Degree III patients had a more moderate benefit of the laser treatment.

[Lik Sprava](#). 2004 Mar;(2):30-5.

## [Effect of low intensity helium-neon laser and decimeter electromagnetic irradiation on functional indices of immune cells in patients with rheumatoid arthritis]

[Article in Russian]

**[Petrov AV](#)**.

Clinical, laboratory, and immunoassay of 58 patients with rheumatoid arthritis, first and

second degree of activity was carried out. Low-energy helium-neon laser exposure and decimeter electromagnetic radiation (DMEM) of peripheral blood was given along with the use of non-steroidal antiinflammatory drugs and methotrexate. Peculiarities of this magnetic-laser effect on proliferation response and apoptosis of mononuclear leucocytes in vitro and in vivo have been revealed. It was also established that the application of DMEM-therapy brought patients with RA in shorter period of time to clinical improvement evaluated by ACR criteria.

Ter Arkh. 1994;66(5):38-41.

**[The mechanism of the action of laser therapy in rheumatoid arthritis]**

[Article in Russian]

[Kozlova IS](#), [Tsurko VV](#), [Piriazeva NA](#), [Volkova ZI](#), [Kariakina EV](#), [Nikolaev VI](#), [Mul'diiarov PIa](#).

48 patients with rheumatoid arthritis (RA) were exposed to He-Ne laser radiation. Due to the course of the above laser therapy the patients displayed reduced levels of E and F2 alpha prostaglandins, a trend to a decrease of lipid peroxidation products, glycosaminoglycans and collagen-peptidase activity. This evidences for suppression of the inflammation and destruction in the connective tissue. Catalase activity in red cells enhanced. The authors point to high efficacy of low-intensity He-Ne laser in moderate rheumatoid inflammation.

Vopr Kurortol Fizioter Lech Fiz Kult. 2000 Mar-Apr;(2):13-8.

**[The combined laser therapy of rheumatoid arthritis]**

[Article in Russian]

[Sidorov VD](#), [Mamiliaeva DR](#), [Derevnina NA](#), [Reformatskaia SIu](#).

Low-intensity infrared laser radiation to the tympanic vessels was studied as one of the hemophysiotherapeutic methods and as a component of combined treatment in which it accompanies local transcutaneous laser radiation of the affected joints. It is shown that immunomodulation is feasible under noninvasive interauricular laser effect on hemostasis. Indications for both laser regimens are formulated. Joint exposure to transcutaneous laser radiation is contraindicated if the affected joints have an exudative component of inflammation

**The interauricular laser therapy of rheumatoid arthritis).**

**Interaurikuliarnaia lazernaia terapiia revmatoidnogo artrita. Sidorov-V-D,**

**Mamiliaeva-D-R, Gontar-E-V, Reformatskaia-SIu.**

Vopr-Kurortol-Fizioter-Lech-Fiz-Kult. 1999; (3): 35-43.

Investigations have proved the ability of interauricular low- intensity infrared laser therapy (0.89 nm, 7.6 J/cm) to produce anti- inflammatory, immunomodulating action in patients with rheumatoid arthritis. The method has selective, pathogenetically directed immunomodulating effect the mechanism of which is similar to that of basic antirheumatic drugs and of intravenous laser radiation of blood. This laser therapy can be used as an alternative to intravenous blood radiation being superior as a noninvasive method. Interauricular laser therapy can potentiate the effects of nonsteroid anti-inflammatory drugs, cytostatics and diminish their side effects.

**CLINICAL APPLICATION OF GaAlAs 830 NM DIODE LASER IN TREATMENT OF RHEUMATOID ARTHRITIS**

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The authors have been involved in the treatment of rheumatoid arthritis (RA), in particular chronic poly-arthritis and the associated pain complaints. The biggest problem facing such patients is joint contracture, leading to bony ankylosis. This in turn severely restricts the range of motion (ROM) of the RA-affected joints, thereby seriously restricting the patient's quality of life (QOL). The authors have determined that in these cases, daily rehabilitation practice is necessary to maintain the patient's QOL at a reasonable level. The greatest problem in the rehabilitation practice is the severe pain associated with RA-affected joints, which inhibits restoration of mobility and improved ROM. LLLT or low reactive level laser therapy has been recognized in the literature as having been effective in pain removal and attenuation. The authors accordingly designed a clinical trial to assess the effectiveness of LLLT in RA related pain (subjective self-assessment) and ROM improvement (objective documented data). From July 1988 to June 1990, 170 patients with a total of 411 affected joints were treated using a GaAlAs diode laser system (830 nm, 60 mW C/W). Patients mean age was 61 years, with a ratio of males: females of 1: 5.25 (16%: 84%). Effectiveness was graded under three categories: excellent (remarkable improvement), good (clearly apparent improvement), and unchanged (little or no improvement). For pain attenuation, scores were: excellent&mdash;59.6%; good&mdash;30.4%; unchanged&mdash;10%. For ROM improvement the scores were: excellent&mdash;12.6%; good&mdash;43.7%; unchanged&mdash;43.7%. This gave a total effective rating for pain attenuation of 90%, and for ROM improvement of 56.3%.

**Lasers Surg Med 1980;1(1):93-101**

**LASER THERAPY OF RHEUMATOID ARTHRITIS.**

Goldman JA, Chiapella J, Casey H, Bass N, Graham J, McClatchey W, Dronavalli RV, Brown R, Bennett WJ, Miller SB, Wilson CH, Pearson B, Haun C, Persinski L, Huey H, Muckerheide M

Thirty people with classical or definite rheumatoid arthritis received laser exposure to a Q-switch neodymium laser that operated at 1.06 micrometer with an output of 15 joules/cm<sup>2</sup> for 30 nsec. One hand was lased at the proximalinterphalangeal (PIP) and metacarpal phalangeal (MCP) joints, whereas the other hand was sham lased. The patient, physician, and occupational therapy evaluators did not know which hand was being lased. Twenty-one patients noted improvement of both their MCP and PIP joints of both hands during laser therapy. Twenty-seven noted improvement of their PIP joints and 26 noted improvement of the MCP joints during therapy. Heat, erythema, pain, swelling, and tenderness all improved with time in both hands, but the lased hand had more significant improvement in erythema and

pain. There was also significant improvement in grasp and tip pressure on the lased side. The level of circulating immune complexes as measured by platelet aggregation decreased during lasing. The improvement may be related to laser exposure. The exact role that laser radiation has upon rheumatoid arthritis and its mechanism of action remain

## **LASER THERAPY IN RHEUMATOLOGY**

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Barabas irradiated first the joints of rheumatoid arthritis (RA) patients without skin ulcer. In the first open study objectively the range of motion and circumference of the treated joints were measured, Ritchie index as semiobjective parameter, subjective parameters as joint tenderness and pain on a visual analogous scale (VAS) were registered. The walking time was registered as a functional disability parameter. Laboratory activity parameters and the <sup>99m</sup>Tc index was measured. The second part of the clinical study was double blinded, Infra Red (10mW and 100 mW) lasers were used versus dummy devices with the same outlook. The third part of the study were in vitro experiments. Synovial membranes of rheumatoid arthritis patients The DNA/RNA ratio of the RA group was compared to the control group. Significant difference was detected between the two groups. The fourth phase of clinical studies was to detect the effects of laser irradiation in other rheumatic diseases: psoriatic arthritis, sacroileitis, osteoarthritis, entesopathy, tenosynovitis, bursitis calcarea, fibromyalgia, localised muscle spasm, peri-arthritis humeroscapularis etc. The different wavelengths (604, 630, 660, 670, 690, 750, 780, 790, 820, 830, 904, 1053, 1219 nm,) were compared (30 - 100 mW) with other physiotherapy modalities, like ultrasound. Acknowledgement: The Central Research Institute of the Hungarian Academy of Sciences and LASOTRONIC AG (Switzerland) was helping the research.

Cochrane Database Syst Rev. 2000;(2):CD002049.

### **Low level laser therapy (classes I, II and III) in the treatment of rheumatoid arthritis.**

Brosseau L, Welch V, Wells G, deBie R, Gam A, Harman K, Morin M, Shea B, Tugwell P. School of Rehabilitation Sciences, Faculty of Health Sciences, University of Ottawa, 451 Smyth Road, Ottawa, Ontario, Canada, K1H-8M5. lbrossea@uottawa.ca

**BACKGROUND:** Rheumatoid arthritis (RA) affects a large proportion of the population. Low Level Laser Therapy (LLLT) was introduced as an alternative non-invasive treatment for RA about 10 years ago. LLLT is a light source that generates extremely pure light, of a single wavelength. The effect is not thermal, but rather related to photochemical reactions in the cells. The effectiveness of LLLT for rheumatoid arthritis is still controversial. **OBJECTIVES:** To assess the effectiveness of LLLT in the treatment of RA. **SEARCH STRATEGY:** We searched MEDLINE, EMBASE, the registries of the Cochrane Musculoskeletal group and the field of Rehabilitation and Related Therapies as well as the Cochrane Controlled Trials Register up to January 30, 2000. **SELECTION CRITERIA:** Following an a priori protocol, we selected only randomized controlled trials of LLLT for the treatment of patients with a clinical diagnosis of RA were eligible. Abstracts were excluded unless further data could be obtained from the authors. **DATA COLLECTION AND ANALYSIS:** Two reviewers independently select trials for inclusion, then extracted data and assessed quality using predetermined forms. Heterogeneity was tested with Cochran's Q test. A fixed effects model was used throughout for continuous variables, except where heterogeneity existed, in which case, a random effects model was used. Results were analyzed as weighted mean differences (WMD) with 95% confidence intervals (CI), where the difference between the treated and control groups was weighted by the inverse of the variance. Standardized mean differences (SMD) were calculated by dividing the difference between treated and control by the baseline variance. SMD were used when different scales were used to measure the same concept (e.g. pain). Dichotomous outcomes were analyzed with odds ratios. **MAIN RESULTS:** A total of 204 patients were included in the five placebo-controlled trials, with 112 randomized to laser therapy. Relative to a separate control group, LLLT reduced pain by 70% relative to placebo and reduced morning stiffness duration by 27.5 minutes (95%CI: 2.9 to 52 minutes) and increased tip to palm flexibility by 1.3 cm (95% CI: 0.8 to 1.7 cm). Other outcomes such as functional assessment, range of motion and local swelling did not differ between groups. There were no

significant differences between subgroups based on LLLT dosage, wavelength, site of application or treatment length. For RA, relative to a control group using the opposite hand, there was no difference between the control and treatment hand, but all hands improved in terms of pain relief and disease activity. REVIEWER'S CONCLUSIONS: In summary, LLLT for RA is beneficial as a minimum of a four-week treatment with reductions in pain and morning stiffness. On the one hand, this meta-analysis found that pooled data gave some evidence of a clinical effect, but the outcomes were in conflict, and it must therefore be concluded that firm documentation of the application of LLLT in RA is not possible. Clinicians and researchers should consistently report the characteristics of the LLLT device and the application techniques used. New trials on LLLT should make use of standardized, validated outcomes. Despite some positive findings, this meta-analysis lacked data on how LLLT effectiveness is affected by four important factors: wavelength, treatment duration of LLLT, dosage and site of application over nerves instead of joints.

Ter Arkh. 1994;66(1):29-32.

### **[The choice of the method for intravascular laser therapy in rheumatoid arthritis]**

[Article in Russian]

[Zvereva KV](#), [Gladkova ND](#), [Grunina EA](#), [Logunov PL](#).

A randomized placebo-controlled study was made of the clinical efficacy of four different methods of intravascular laser blood irradiation (ILBI) with helium-neon laser in 150 patients suffering from rheumatoid arthritis (RA). As to ILBI methods used, the most remarkable clinical effect was produced by daily procedures. The positive effect of ILBI was of liminal character bearing in mind the power range examined whereas the negative effect of irradiation was dose-dependent. ILBI may cause an exacerbation of the inflammatory process in RA whatever the single dose and frequency of procedures. The best clinical effect with daily ILBI was attained in women, individuals with the presence of rheumatoid factor but with low titers thereof, and in patients with initial stages of RA and minimum inflammation activity. The efficacy of ILBI may be predicted on the basis of the patient's clinical findings.

Br J Rheumatol. 1994 Feb;33(2):142-7.

### **Low level laser therapy is ineffective in the management of rheumatoid arthritic finger joints.**

Hall J, Clarke AK, Elvins DM, Ring EF.

Rehabilitation Laboratory, Royal National Hospital for Rheumatic Diseases, Bath.

Low level laser therapy (LLLT) is a relatively new and increasingly popular form of electrotherapy. It is used by physiotherapists in the treatment of a wide variety of conditions including RA despite the lack of scientific evidence to support its efficacy. A randomized, double-blind and placebo-controlled study was conducted to evaluate the efficacy of LLLT. The patient sample consisted of chronic RA patients with active finger joint synovitis. Forty RA patients with involvement of some or all of MCP or PIP joints were recruited. Following random allocation they received either active or placebo laser three times a week for 4 weeks. Measurements were taken prior to entry, after the treatment, 1 month and 3 months at follow-up. The groups were well matched in terms of age, sex, disease duration and severity. Few significant differences were noted in grip strength, duration of morning stiffness, joint tenderness, temperature of inflamed joints, range of movement or pain either within or between groups. Using these irradiation parameters the efficacy of LLLT is ineffective.

## **THE EFFECTIVENESS OF LASER THERAPY IN COMPLEX TREATMENT OF PATIENTS WITH RHEUMATOID ARTHRITIS**

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The purpose of this research is to evaluate the effectiveness of laser therapy among patients with different extents of rheumatoid arthritis (RA) disease. There has been a study of 115 patients with RA activity II-III (the main group) who apart from the basic therapy also received laser treatment.

The apparatus ALT "Mustang" with the power of 2-10 W and infrared wave range has been used. The laser influence has been aimed at the area of a damaged joint. The duration of laser influence is from 5 to 17 minutes, adding 1-2 minutes daily. The number of fields is 10, the number of treatment procedures -8-10, The control group consists of 20 patients with RA (basic therapy only).

The control of effectiveness of the therapy was based on the complex laboratory data, including definition of non-specific factors of inflammation and the factors of activity of lipid peroxidation.

The greatest effect of the therapy has been achieved in the main group of patients with activity II. In comparison with the control group we managed to receive improvement 8-10 days earlier which allowed us to reduce the demand of steroids and in case of 20 patients even cancel taking them. We received statistically reliable fall of the activity of inflammation and lipid peroxidation. More moderate effect of the therapy was reached treating patients from the main group with activity III.

## **THE USE OF SUPRAVASCULAR BLOOD RADIATION WITH INFRARED LASER FOR TREATMENT OF SECONDARY VASCULITIS IN PATIENTS WITH RHEUMATOID ARTHRITIS**

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The purpose of this work was to study the opportunity of the use of supravascular blood radiation with infrared laser (IR-laser) for the treatment of secondary vasculitis in patients with rheumatoid arthritis (RA). The investigation included 12 patients with RA and secondary vasculitis signs. They received a course of supravascular blood radiation with IR-laser (wavelength 820-850 nm, 7-10 procedures). Control group consisted of 8 patients. Placebo laser therapy (LT) was administered to 7 patients. Such characteristics as hemostasis properties, a state of microcirculation in bulbar conjunctiva vessels were studied in all patients before and after treatment. It was revealed significant decrease of both XIIa-dependent fibrinolysis and Willibrand's factor level. The improvement of blood rheological properties was confirmed by a decrease of erythrocyte aggregation and improvement of its deformability. Bulbar conjunctival microscopia revealed significant diminution of intravascular change index, significant increase of arteriola-venula ratio. The improvement of nephritis manifestations (significant decrease of proteinuria level).

The changes of hemostasis parameters microcirculation system were not significant in patients receiving both placebo LT and conventional therapy. Conclusions: 1) It was revealed significant diminution of endothelium lesion and XIIa-depended fibrinolysis restoration after IR-laser therapy in patients with RA and secondary vasculitis. 2) Both microcirculation state in bulbar conjunctiva vessels and blood rheological properties significantly improve after IR-laser therapy. It is confirmed by a significant improvement of erythrocyte deformability and a decrease of its aggregation. 3) IR-laser therapy leads to urinary syndrome regression.

## **DIAGNOSTIC SIGNIFICANCE OF THE IMMUNITY INDICES INVESTIGATION IN THE USE OF LASER THERAPY IN PATIENTS WITH RHEUMATOID ARTHRITIS AND THE DISEASE COURSE PROGNOSIS**

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The results of the examination of the patients with rheumatoid arthritis (RA) have shown the systemic lesion of all the links of the immune system. Many-sided positive influence of low energy laser irradiation on the impairment of immune homeostasis has been shown. The aim of the investigation was to study the possibility of the low energy laser irradiation use in patients with RA depending on some immunity indices and the disease course prognosis. 60 patients with RA at the age of more than 16 years old having inflammatory process activity of the I-II degrees according to the RA criteria of the American Rheumatological Association classification have been examined. 30 patients of the control group underwent the conventional treatment with non-steroid anti-inflammatory drugs, basic treatment with delagil and physiotherapy. 30 patients of the main group underwent the conventional treatment and laser therapy on the joints by the infra-red laser installation "UZOR" with the wavelength of 0,89  $\mu\text{m}$ , the output power of 2 mW in combination with the above-vein blood irradiation by the helium-neon laser installation "ALOK-1" with the output power of 0,6 mW. The treatment was carried out daily during 15 days. The immunity indices analysis before and after the treatment in both groups has established their obvious improvement in patients treated by laser irradiation: T-lympocytes (CD3 ( $p < 0.05$ ), immunoglobulins ? ( $p < 0.05$ ), T-helpers inductors (CD4+) ( $p < 0.05$ ). The positive dynamics of the immunity indices in the studied group cor-related with the clinical improvement of the patients condition and depended on the marked immunity indices changes before the treatment, such as T-lymphocytes (CD3), T-helpers inductors (CD4+), immunoglobulins C. The marked positive dynamics of the abovementioned indices were not observed in the control group.