

Chapter I

THE INTRAVENOUS LASER BLOOD IRRADIATION - INTRODUCTION OF A NEW THERAPY

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1. Introduction

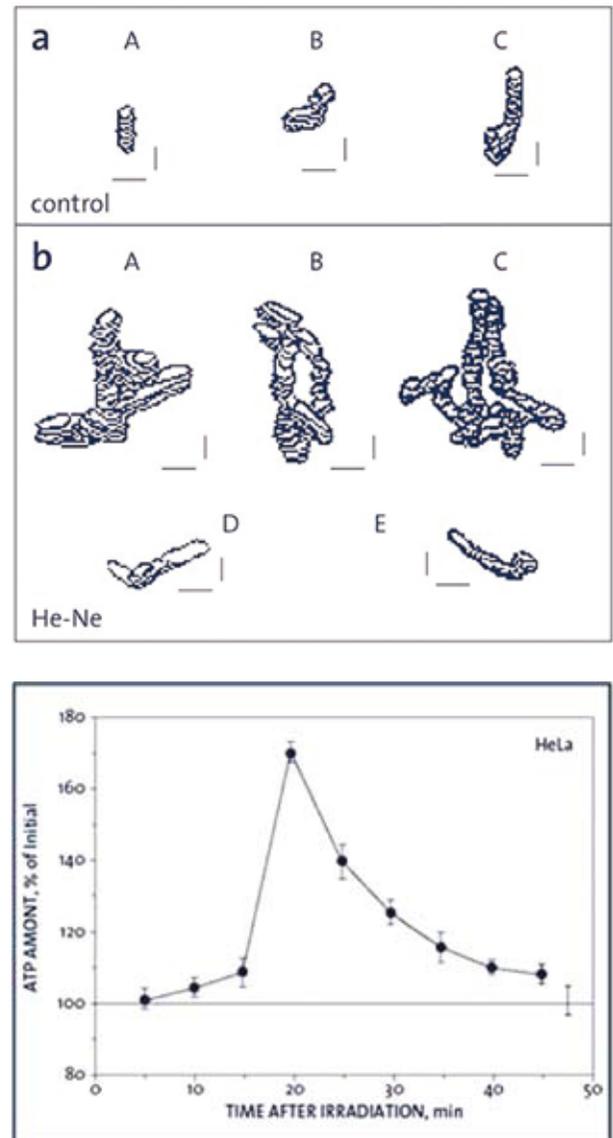
The method of intravenous laser blood irradiation was first introduced into therapy by the Soviet scientists E.N.Meschalkin and V.S.Sergiewski in 1981 [32]. Originally this method was developed for the treatment of cardiovascular diseases. Improvement of rheologic properties of the blood as well as improvement of microcirculation and reduction of the area of infarction had been proved. Further reductions of dysrhythmia and sudden cardiac death occurred [4,21]. At first only the helium-neon-laser (632.8 nm) was used in this therapy. For that a power of 1-3 mW and a period of exposure of 20-60 minutes were applied. The treatments were carried out once or twice a day up to ten appointments in all. In the years after many, for the most part Russian studies showed that helium-neon-laser had various effects on many organs and on the hematologic and immunologic system. The studies were published mainly in Russian which were little known in the West because of decades of political separation, and were regarded with disapproval. Besides clinical research and application for patients the cell biological basis was developed by the Estonian cell biologist Tiina Karu at the same time. An abstract is to be found in her work "The Science of Low-Power Laser-Therapy". [19].

2. Effects and mode of operation of intravenous Low-Level-Laser-Therapy of the blood

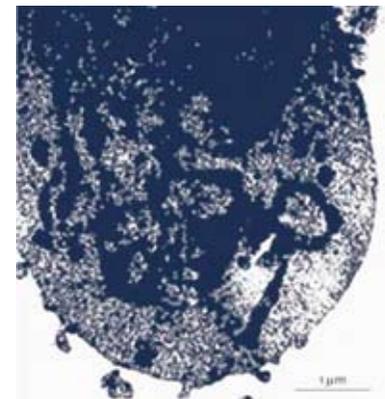
1. Under laser blood irradiation anti-inflammatory effects were observed that improved the immunologic activity of the blood.
2. A fundamental finding was the positive influence on rheological properties of the blood which is of greatest interest to surgery, angiology and cardiology in particular [50]. A diminishing tendency of aggregation of thrombocytes and an improved deformability of erythrocytes result in an improved oxygen supply and with that to a decrease of partial carbon dioxide pressure, which is particularly relevant to wound healing [10, 27, 59]. Furthermore the activation of phagocytic activity of macrophages was proved in conjunction with structural modifications [8, 22]. A positive effect on the proliferation of lymphocytes and B- and T-cell-subpopulations could be verified too [13, 50, 38].

3. The hypoxia of the tissue will be improved which leads to a normalization of the tissue metabolism. In addition the fibrinolysis will be activated [35]. Apart from the elimination of hypoxia and the normalization of tissue metabolism an increase of ATP-synthesis will occur with a normalization of cell membrane potential. [44]. Additional vasodilatation is leading to de-blocking of capillaries and collateral vessels in connection with the described improved rheological properties of the blood together with an improved trophicity of tissues and normalization of neurosensory stimulation. The increased release of NO from monocytes obviously is of critical importance [29]. Because of the described effects the intravascular blood-irradiation is used in Russian surgical university-clinics pre-operatively to avoid thromboembolic complications, and improve postoperative woundhealing [12,27]. In addition there are laser specific analgetic, spasmolytic and sedative effects [14]. There are reports on patients with chronic glomerulonephritis who had significant improvement of tolerability of medication (glucocorticoids, cytostatic drugs, diuretics) and of kidney function [30]. In the same way an improvement of inflammation parameters in acute pyelonephritis could be shown [7]. In necrotising pancreatitis an improvement of blood lab values and of the immunological parameters had been proved too.

4. Intravenous blood irradiation was widely used in obstetrics and gynecology to stimulate utero-placental blood exchange and as a prophylaxis and therapy of inflammations of the interior genitals [11].
5. Furthermore it was observed that mitochondria changed to so called "giant mitochondria" (picture 1) after laser-irradiation with activation of various metabolic pathways and increased production of ATP [31] (picture 2). The electron microscopy of "giant mitochondria" revealed intracellular annular ("ring-shaped") structures (picture 1 and 3). These mitochondrial changes cannot be compared with pathological giant mitochondria as they appear in certain clinical syndromes. In these syndromes we can observe pathological swelling of the organelles and deposit of pathological paracrystalline albumins leading to specific myopathies [47].



Picture 2: Increase of ATP with laser-irradiation (632 nm) of HeLa-cell culture source: Karu [19]



Picture 3: Ringshaped „Giant mitochondria” of irradiated human leucocytes with helium-neon-laser 632 nm source: Manteifel et al. [32]

The structure of mitochondria may vary strongly according to the type of cell. They can impress as sausage shaped organelles, but may also appear as a highly branched intercommunicating tubular network. Observations of fluorescence marked mitochondria in living cells have shown that they are dynamic and may vary their shape strongly. Above all it is important that mitochondria may merge with each other, or divide themselves. Probably the balance between fusion and division is decisive for the shape and form of a mitochondrion [18]. It was shown in histological researches on helium-neon laser irradiated lymphocytes that by development of so called giant forms the number of mitochondria was diminishing simultaneously, but the total volume was unchanged. It was detected that the cause of the development of “giant mitochondria” was a fusion of smaller mitochondria [2, 31]. Manteifel and Karu proved big branched forms of mitochondria in germinating yeast cells, but after laser-irradiation an expansion of the tubular network developed without damaging the organelles [32]. These mitochondria are marked by a relative enlargement of surface of the mitochondrial cristae due to activation of the respiratory chain and ATP-synthesis. It has to be mentioned that the description of the development of mitochondria to giant mitochondria is discussed controversially. Heine (reviewer of this article) is pointing out that there is no evidence that such pathological forms of mitochondria will lead to an activation of varied metabolic pathways leading to an increase of ATP-production. Heine described the way of reproduction of mitochondria in 1979: Whenever there is a need of additional ATP they will divide, but not fuse with each other [17]. Obviously there seem to be generalized effects of the intravenous blood-irradiation on almost every organ system so that this therapy may be employed in the treatment of various diseases causally or additively. Gasparyan described the improvement of microcirculation especially in central nervous structures. In particular, this is most important in the hypothalamus which has a highly developed vascular micro system. He assumes that the intravenous blood-irradiation is stimulating the functional activity of the hypothalamus and limbic system leading to an activation of hormonal, metabolic, immunological and vegetative processes with mobilization of adaptive reserves [11].

TABLE 1 Described effects of intravascular laser blood-irradiation

Stimulation of immune response, specific and non-specific
Increase of the immunoglobulines IgG, IgM and IgA
Stimulation of interferons, interleukins and TNF-alpha
Stimulation of the proliferation of lymphocytes
Increase of phagocytic activity of macrophages
Lowering of CRP
Improvement of the anti-oxidant enzymatic system with antitoxic effect
Improvement of regeneration of erythrocytes and of microcirculation
Reduction of aggregation of thrombocytes
Activation of fibrinolysis
Stimulation of the NO-production in monocytes with vasodilatation and improvement of endothelial dysfunction
Fusion of mitochondria to “giant mitochondria” with increase of ATP-production in the respiratory chain
Normalization of the cell membrane potential

3. Comparison of intravenous laser with ultraviolet irradiation of the blood (UVB and HOT)

For the ultraviolet irradiation of the blood a certain amount of blood is taken out of the vein, anticoagulant substances are added and after UV-C-irradiation led back to the body by reinfusion (UVB-therapy).

In haematogenous oxidation-therapy (HOT) the blood is frothed with oxygen additionally before it will be irradiated with ultraviolet light [9]. As a result there are various positive effects, very similar to the effects of intravenous laser blood-irradiation mentioned above. Basically it is not surprising because in both types of therapy high-energy photons are administered to the blood - with stimulation of immunological and cellular biological processes, and influences on rheology. Comparing both methods, the difference lies in the fact that in intravenous laser blood-irradiation no blood has to be taken out and no additional anticoagulants are required. The blood will not be cooled down or modified with intravascular therapy by means of a disposal catheter. There is no risk of aggregation with causing of coagula, and constant observation of the patient is not necessary.

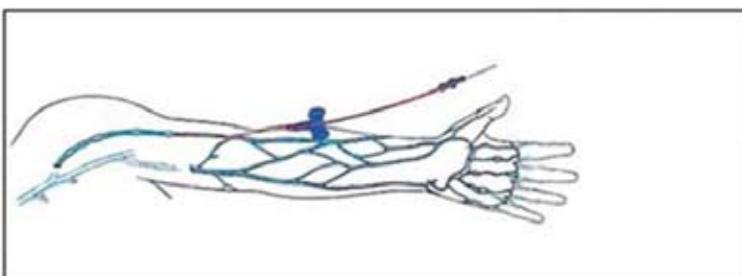
The use of monochromatic laser-irradiation in contrast to non-monochromatic ultraviolet-irradiation is considered to be an additional advantage. Since nowadays we have essential understanding of absorption- and action spectra of the various intracellular macromolecules and electron-carrier-systems [19], calculated biological effects can be set off with defined wavelengths in the catalytic centers of these structures. It is a known fact that e.g. the cytochrome-C-oxidase-complex as the final part of the mitochondrial respiratory chain is absorbing in the red- and infrared range, and the NADH-complex as the first component is absorbing in the blue range. Another advantage of laser-light beside monochromasy is the coherence of the radiation which by means of particular order functions (in-phase-conformity of the waves) possibly has specific biological effects. A specific effect of coherence on cellular structures is however discussed controversially.

Light of the visible and the infrared spectrum is regarded as less dangerous than ultraviolet light. Today there is a well known borderline of 320 nm beyond that, ultraviolet light may cause fractures of the DNA-chains.

This risk does not exist in the visible and near infrared spectrum.

4. The consideration of intravenous laser blood-irradiation as “blood-acupuncture” by dissolving of blood stasis

In Chinese Medicine the term “Xue” is of great importance. It comprises the most important body juices including the blood. By means of the continuous circulation nutrients are transported to all organs and structures. Xue and Qi are closely linked to each other. In the TCM Qi is commanding the blood: when Qi is moving, the blood is moving, when Qi is stagnating, so blood is stagnating. Therefore it also can be said: Blood cannot flow without Qi, Qi cannot be held without blood [61]. Stagnation of blood and Qi are called blood-stasis-syndrome [37]. This we are trying to influence in



Picture 4: Diagram of intravenous laser blood-irradiation inside of the elbow

classical acupuncture by needling specific points. Looking at blood-circulation hypothetically as a central interior meridian of its own, this method of stimulating the flow of blood and Qi by means of intravenous laser blood-irradiation could be perfectly called “blood-acupuncture”. An interpretation of that kind could not be made with the ultraviolet-therapy of the blood mentioned above by definition.

5. The relationship of intravenous laser blood-irradiation with the system of basis-regulation according to Pischinger and Heine as well as on physiological leucocytolysis

The intravenous laser blood-irradiation is a biological therapeutic method that seems suitable to intervene in the system of basis-regulation. The meaning of this system is the functional connection between capillaries (the “end stream”), basic substance (extra cellular matrix [ECM]) and cells. The extra cellular matrix is located between the capillaries and the cells, and represents a kind of molecular-sieve in which vegetative nerve fibres have their final spreading, and by that establish a connection to the entral nervous system and the endocrinium (hypothalamus). This molecular-sieve presents the transit route of the entire metabolism from the capillaries to the cell and back. It is mainly formed by proteoglycanes, glucosaminoglycanes, structure-proteins like collagen, elastin and the network-ing-glycoproteins like fibronectin. There are various defensive cells in the ECM that control the synthesis and the decomposition of ECM-components by means of a cytokine-network. By ageing and chronic oxidative stress with an increasing production of radicals, acidosis and clogging-up of ECM will grow, with a restriction of this vital molecular-sieve effect. A reduction of the antioxidant enzyme-system is additionally negative increasing. The increasing transferral of the transit route leads to micro- and macroangiopathies. The acidosis may furthermore encourage the forming and spreading of tumor cells through pro-inflammatory effects. The described antioxidant, antiacidotic and antiinflammatory effects of intravenous blood-irradiation and the modulation of the immune system could have manifold effects on the system of basis-regulation and the extra cellular matrix. Possibly there could be a certain protective effect on the development of tumor cells. It is possible that general ageing processes which go hand in hand with the above-mentioned clogging-up of ECM with pro-inflammatory effects and with increased formation of radicals, could be positively influenced. Seen from this angle the intravenous laser blood-irradiation could also be considered as anti-aging-therapy, in particular when combined with additional useful methods like diet, orthomolecular therapy, acupuncture, neural therapy or homeopathy. Another important aspect is the physiological leucocytolysis. Approximately 1.2 million leucocytes of the in all 1-2 billion leucocytes of the organism are in the process of disintegration every second. By this mechanism a great number of mediators like cytokins, chemokins, prostaglandins, leucotriens and many others are released. These immunomodulators can intervene to regulate changes of milieu of blood plasma and extra cellular matrix. The ability of leucocytes to physiological lyses is according to Pischinger and Heine the “pivot of all naturopathic treatments” and measures of regulation medicine. You will find detailed presentation to these topics in “Lehrbuch der biologischen Medizin” by Heine [16]. It is obvious that the intravenous laser blood irradiation can stimulate physiological leucocytolysis similar to other immunomodulating therapies. Respective researches for that are still pending.

6. Method: Practical application of Intravenous Laser Blood Irradiation

Intravenous laser blood irradiation is carried out with low power of 1-3 mW and an exposure time of 20-60 minutes. A series of 10 treatments will be carried out either every day or three times a week with a weekend break.



Picture 5: Intravenous laser blood irradiation with a 632 nm red light

For intravenous laser blood irradiation first of all you have to feed in a cannula into a suitable vein of the elbow or the forearm. The vein should have a wide lumen to catch a great volume of blood in the period of time. In the Russian studies a simple steel-cannula was inserted in which a disposal laser plastic-catheter was fed in and was connected to a laser diode [picture 4]. This procedure was modified by the author by feeding in a blue plastic cannula for children (Braun Medical, Melsungen) into a suitable vein and then a newly developed disposable laser-catheter made of biological compatible plastic material is inserted into the vein (picture 5).

With veins that are difficult to puncture or if there is lack of practice, the setting of the cannula may cause problems, but recently a suitable little butterfly was developed which permits an easy application of the above described catheter. The advantage of this therapy is that it can be learned by an assistant or a nurse, so the doctor has not to be right next to the patient all the time.

7. Innovations

7.1 The new green laser in intravascular laser blood irradiation

Up to now it was believed that especially irradiation in the red range was particularly effective due to the absorption spectrum of cytochrome-C-oxidase in the respiratory chain with a stimulation of the ATP-synthesis. The originally Russian studies were all carried out with red light laser of the wavelength 632,8 nm of the helium-neon-laser because in the beginning there was no laser in the shorter wave range (green or blue) available. When red laser light is conducted into the bloodstream, the vein lights up in bright red because the red light is not absorbed by the erythrocytes (picture 5). So actually it should make sense to use complementary green laser light for laser blood irradiation as well (picture 9). When green laser light is conducted into a vein you practically will not see any green shining through the skin since the “red” erythrocytes are absorbing green light virtually completely (picture 14) [41]. This therapy was introduced by the author for the first time to laser blood irradiation and many of the patients treated with red laser light were treated with green laser once more, and the results were compared with red light laser. On that occasion it turned out that the green laser causes corresponding stimulations too and obviously reacts on various parameters in a different way or better than the red light laser. In a third cycle some of the patients were treated then with a combination of red and green laser - with the idea to stimulate the leucocytes initially with the red laser and to load energy on the erythrocytes with the green laser. Then it turned out that the combination of both types of laser obviously reveal the best possible effect. These results represent however just first impressions and they have to be investigated further intensively to obtain valid data. Reviewing the latest literature, really, the green laser was also tested in the irradiation of blood by other scientists recently. An article was published from MI et al. of Shanghai university in March

2004 [34] where blood cells were irradiated in vitro with the wavelength 632,8 nm (helium-neon laser) and 532 nm (green laser). In these experiments it could be shown that the green laser had an advantage on rheologic properties of the blood by an improved deformability of erythrocytes. The corresponding absorption spectrum for hemoglobin was assumed as cause for the green laser effect in particular. In a recent work of Kassak and colleagues of Bratislava university, Slovakia, in cooperation with the department of General Biophysics of Lodz university, Poland [20], the effect of green laser light on Na-Ka-ATPase was investigated. A distinct stimulating effect of the green laser light on the activity of the erythrocyte Ka-Na-ATPase was shown (picture 7). These latest findings are of exceptional significance. Previous explanatory models of the photobiochemical energy transfer model followed the mitochondrial structures and the electron carrier systems in the respiratory chain, but these are not existing in erythrocytes. According to previous ideas an absorption of green laser photons to the erythrocytes would be only transferred into a local warming up. The evidence of an increased Na-Ka-ATPase permits the conclusion that besides the warming up also structural molecular changes are activated with triggering of specific biochemical activity. So the membranous lipid layers can also change [20]. In another work from Vinck and colleagues of the department anatomy, embryology and histology of the University of Ghent, Belgium, it could be shown in April 2005 that under green light irradiation it comes to an increase of fibroblast proliferation with an improved effect on glucose metabolism [52]. It must be emphasized here again that the described works on green laser so far were exclusively in-vitro-experiments. The first human investigations with green light laser blood irradiation were made by the author himself and have been described in this presented work here for the first time.



Picture 9: The green laser with a wavelength of 532 nm



Picture 10: The blue laser with a wavelength of 405 nm

7.2 The blue laser in intravascular laser blood irradiation

The blue laser has a distinct absorption for porphyrins on account of its wavelength of 400-470 nm, so consequently for hemoglobin too [54, 41]. So far there are only a few scientific data of clinical application with patients since it succeeded just a short time ago to build a solid blue semiconductor laser from galliumnitride (picture 10). It became public that caries, periodontosis and acne can be treated with blue LED (light-emitting diode) with good success because they are also emitting monochromatic light (but without deep-acting coherence) [55]. According to late researches *Helicobacter pylori* can be eradicated successfully by application of blue light over the gastroscope [15]. Cause of these effects is the bactericide effect of the blue monochromatic light that is binding to bacterial porphyrins and destroying them by release of reactive oxygen radicals. Tiina Karu

showed in several works that in the mitochondrial respiratory chain the red as well as the infrared laser light stimulates the last complex of the respiratory chain, the so called cytochrome-C-oxidase, while the first complex, the so called NADH-dehydrogenase, has its absorption maximum in the blue range [19]. So it is possible to stimulate this “starter complex” by irradiating with blue laser. This effect will be of considerable importance for the intravenous laser blood irradiation. From the works of the Armenian laser scientist Levon Gasparyan the first data are already available [11]. He was able to show that under irradiation of the blood with blue laser light of low power (0,3 mW) the rheology of the blood will be significantly improved and as a result the microcirculation will improve too. According to the latest data collected by him also cases of tinnitus resistant to other therapies can be treated more successfully than before. Furthermore it was reported that metabolism effects lead to a significant decrease of cholesterol, triglycerides and blood-glucose and bilirubin. The immunologic activity of the blood is increasing significantly according to Gasparyan [11]. Due to its proximity to the ultraviolet spectrum it is assumed that in the therapy of the blood the blue laser is also inducing the well-known immunostimulating effects as they are known from the UVB-treatment of the blood [9, 11]. In a work from October 2006 the blue laser was also used diagnostically to trace tumor cells. Due to strong absorption impulses of the blue laser cause circulating melanoma-cells in the blood to swing and to emit signals that can be recorded with highly sensitive microphones. This is called photoacoustic detection [54].

8. Clinical studies:

8.1 The Results of eastern studies

An extensive study of the Academy of Medicine Wolgograd on 175 patients with chronic liver diseases, including forms of chronic hepatitis and cirrhotic liver was published in German translation, 2002 [47]. After a series of 10 treatments with 630nm 1mW red light laser for 40 min a significant improvement of the antioxidant enzyme system and a long lasting significant reduction of pathological increased liver parameters were achieved. In 2002 several most interesting articles on the influence of long term complications and fat metabolism disorders connected with diabetes mellitus, were published by the Russian doctor Tatjana Kovalyova (Department, 2. Municipal Clinic Izhevsk, Russia) translated by Prof. Marti, Institut für LLLT & Naturheilkunde, Thun/Switzerland [24, 25]. The patients were treated in three series with 10 sessions every day over a span of six months.

This therapy was performed as so called combined laser therapy, that means besides the intravenous laser-application additionally the regions of liver, pancreas and spleen were irradiated transcutaneously. An almost statin-equivalent reduction of lipid parameters was described as well as a significant reduction of various typical diabetic complications such as retinopathies and angiopathies [24]. D. Siposan and colleagues of the Bucharest University, Romania, could prove in a study on 40 patients in August 2004 a significant improvement of the aggregation tendency of erythrocytes and a stabilization of the erythrocyte membranes [44].

Even an improvement of the life-threatening situation of hemorrhagic shock could be shown in a study by Kozura and colleagues in 1993 [26]. Spasow and colleagues described in September 2000 a significantly improved tolerability of medication on patients with chronic hepatitis [48]. Khotiainsev et al. described the effects of the electrophysiological efficiency of laser blood irradiation in acute coronary syndromes on 200 patients in 1996 with the conclusion that this therapy results in distinct positive changes of electrophysiological characteristics of the cardiovascular system with corresponding antiarrhythmic effects [21].

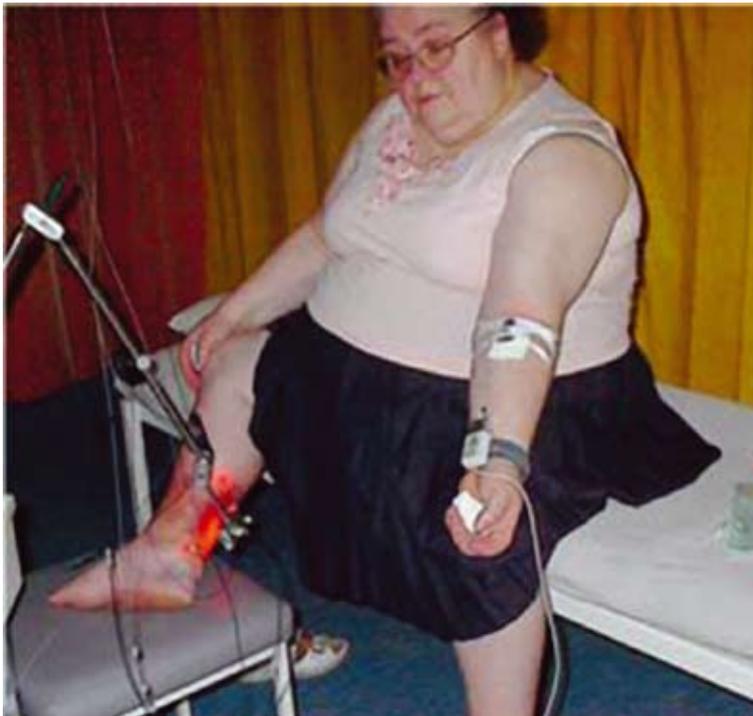
8.2 Results of the first own pilot study 2004



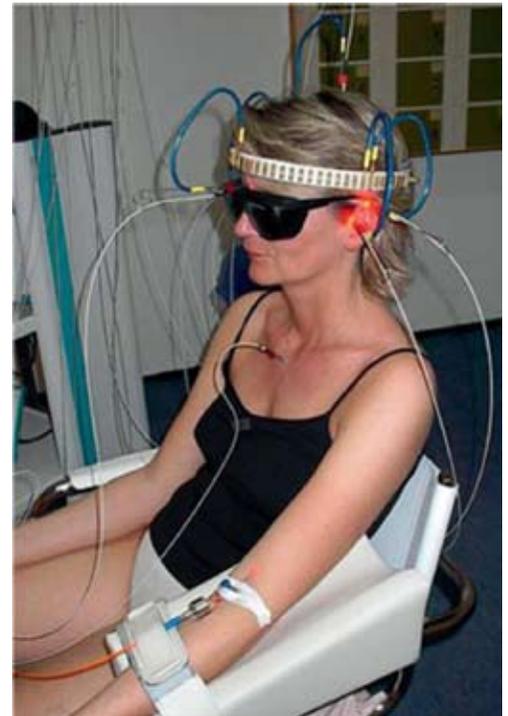
Picture 6: Certified laser blood irradiation system with biocompatible disposable catheters, Source: M. Weber [53]

Since the described method after reviewing the available literature seems to have an astounding scientifically interesting potency, the author decided to reproduce at first the most remarkable results of the studies of the Russian literature. The quoted study of Skvorcov et al. on treatment of chronic liver diseases [46] and the large-scaled studies of Kovalyova on treatment of diabetics with fat metabolism disorders [24, 25] were taken as a basis. For verification of the mentioned studies, 20 patients with diabetes mellitus and 15 patients with chronic liver diseases were included in a first pilot study in 2004 and were treated according to the Russian schedule with intravascular red light laser therapy (632 nm, 1,5 mW, 30 min) and transcutaneous irradiation of liver, pancreas, and spleen at the points Lv 13, Lv 14 right side, and CV 12 with infrared laser (810 nm, 100 mW) for 20 minutes.

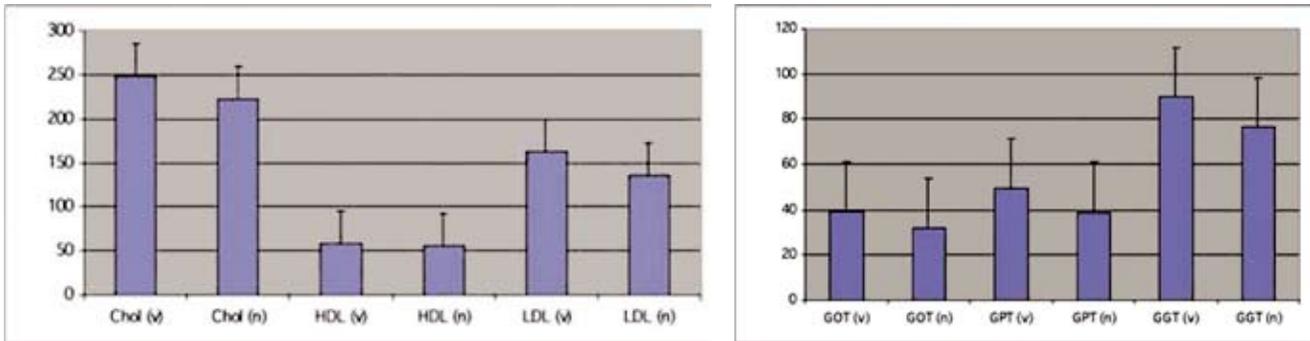
The intravascular treatments were carried out with the new type of laser blood irradiation system “weberneedle blood” of weber medical, Lauenförde (Germany) (picture 6) [53]. For the external irradiation the weberneedle-basic laserneedle acupuncture system with infrared laser needles was used.



Picture 12: Combined laser therapy in an allergic patient
Source: Treatment case practice of the authors



Picture 11: Combined laser therapy in a diabetic patient with ulcer cruris
Source: Treatment case practice of the author



Picture 13: Results of the 1. Pilot study 2004

Picture 12 shows the treatment of a patient suffering of severe allergy with intravascular laser blood irradiation combined with laserneedle acupuncture.

Picture 11 demonstrates the treatment of a diabetic patient with intravenous laser therapy and external laser irradiation of an ulcer cruris.

On the whole the described results of the Russian literature could be confirmed. Actually there was a significant decrease of chronically increased liver and lipid parameters, but the reduction of LDL-cholesterol was significant above all. In individual cases a drop of pathological HbA1c values was observed, but the validity of the figures is limited because the majority of diabetics were already well adjusted. On ethical grounds a discontinuation of a preceding antidiabetic medication could not be justified. A maximum of improved laboratory parameters was observed as a rule mostly after six to twelve weeks. Because of this characteristic course one could conclude that the postulated long term cellular changes were modified at first and without any therapeutical procedures, had an effect with temporary delay only. However immediate effects were observed, especially a tendency of hypoglycemia on stabile adjusted diabetics.

8.3 Own Treatment data 2005

114 patients with a variety of clinical syndromes had been treated and evaluated in the year 2005 by the author himself. The treatments were carried out according to Russian instructions as combined treatments with laserneedle acupuncture. Partly it concerned patients who previously showed unsatisfactory results with acupuncture exclusively.

- fat metabolism disorders (n = 20)
- diabetes mellitus (n = 20)
- chronic pain syndrome (n = 12)
- rheumatoid arthritis (n = 5)
- polyneuropathies (n = 4)
- chronic-inflammatory bowel diseases (n = 5)
- fibromyalgia (n = 7)
- hypertension (n = 6)
- tinnitus (n = 3)
- macular degeneration (n = 4)
- multiple sclerosis (n = 9)

- burn-out-syndrome (n = 9)
- allergies and eczemas (n = 10)

The following effects could be verified by a questionnaire survey and the evaluation of clinical tests and laboratory parameters:

General Effects

- significant improvement of general fitness
 - improvement of sleeping behaviour and vigilance
 - positive effect on general mood
 - reduction of drug consumption
- #### Special Effects
- optimization of diabetic metabolism
 - partially statin comparable influence on hypercholesterinemia
 - significant lowering of pathological increased liver values
 - reduction of relapse in chronic-inflammatory bowel diseases
 - improvement of general well-being and mobility in multiple sclerosis
 - positive influence on therapy-resistant pain syndromes
 - in some cases positive influencing of tinnitus (ringing in the ear)
 - reduction of antihypertensive medication in severe hypertension

Since its introduction and certification in March 2005 the laser blood irradiation method was established in more than 300 centers in Germany, Austria, Switzerland, Italy and Australia until the end of 2006. From the amount of ordered disposable catheters one can find out that there were carried out approximately 100,000 treatments in the various centers because the disposable catheter is not available elsewhere. A major poll was held at the end of 2006. On the occasion the following points should be considered:

- Acceptance by the patient
- Side effects
- Effects on the general state of health
- Presentation of special effects on the basis of case studies

This survey was a first major multicenter evaluation. A scientific evaluation of precise data will be made at a later time since the method is still new and many centers applied this therapy just in the course of 2006. After the evaluation of the questionnaires the above effects on the general state of health and general fitness and on the special effects of the provided case studies could be confirmed entirely. The acceptances from the patients were rated to be good by everyone, and there was no report on severe side effects. There are exceptionally interesting case studies that will be published later.

8.4 Results of a second own pilot study 2006

The results of the first pilot study of the year 2004 were carried out as reported above according to the Russian schedule as a combined laser therapy i.e. as a combination of intravenous laser irradiation with transcutaneous liver-spleen-pancreas-irradiation. In order to verify the effects of laser blood irradiation alone without additional transcutaneous irradiation or acupuncture, 20 patients with diabetes mellitus, fat metabolism disorders and chronic liver diseases were treated in the practice of

the author once more with ten treatments each.

It turned out under laboratory supervision that blood irradiation as mono therapy did not provide comparable specific results in the described diseases so that an additional transcutaneous laser irradiation (laser acupuncture) is given preference to achieve the best effects.

8.5. Studies on Multiple Sclerosis

Multiple sclerosis (MS) is an isolated central nervous system disorder of unclear origin. Initially inflammatory processes predominate, degenerative developments ensue during the following progress. Disturbances of the motor and sensitive system come to the fore of symptomatology, culminating in restrictions of visual capacity due to inflammatory processes of the central nervous system. A massive chronic exhaustion subsequently often ensues, which may cause inability to work and for which no effective therapy is known. Concordance with the HLA system is known, affecting the autoimmune and inflammatory processes. In terms of aetiology, an autoimmune, neurodegenerative and inflammatory origin is discussed.

The current prevailing doctrine assumes that a T-cell-dependent disorder with initial secondary macrophage activity and myelin sheath destruction is concerned. An immunosuppressive treatment is normally carried out nowadays.

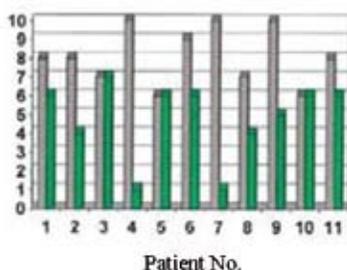
8.5.1. First Multiple Sclerosis Study

The German neurologist Schumm published a first pilot study on 16 multiple sclerosis patients in the year 2006 [42].

The patients were treated ten times on the whole only with red light laser (632 nm, 1,5 mW) of the Weber-needle-blood-device for 30 minutes each without any additional treatment.

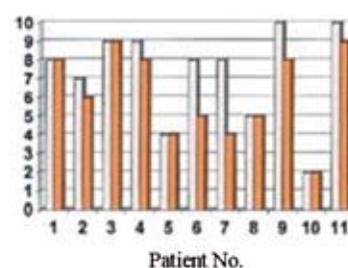
For the evaluation of the general well-being and the sensomotor disorders the so called EDSS (Expanded Disability Status Score) was taken as a basis. On the whole an improvement turned out in 73 % of the chronic fatigue-syndrome (picture 7) and in 64 % an improvement of the sensomotor disorders (picture 8). After years of experience as a neurologist Schumm reasoned that the positive effects of intravenous laser blood irradiation is comparable with interferon therapy of multiple sclerosis but not burdened with any side effects.

Improvement of the Fatigue Syndrome



picture 7: Self-assessment of the patients regarding motorial and sensitive disorders regarding the fatigue-syndrome before and after therapy. Source: N. Schumm [42]

Improvement of the Senso-motor disturbances



picture 8: Self-assessment of the patients before and after therapy. Source: N. Schumm

8.5.2. Second Multiple Sclerosis study

In 2008 Schumm published a new article in the Journal of Integrative and Complementary Medicine with the title

”Laser blood irradiation for multiple sclerosis: a new treatment procedure with significant improvement of the quality of life” [43].

Methods

In this study again the “weberneedle® blood” system was used, but the treatments were done with a combination with red (632nm) and green laser (532nm) irradiation.

Questionnaire on General Health Condition SF 12

Patient:	Date:	Time frame:	Week(s)
Diagnosis:			

1. How would you generally describe your health condition?	excellent	very good	good	slightly good	bad
	1	2	3	4	5

How are you restricted in your activities and health condition?	severely restricted	somewhat restricted	not at all restricted
2. ... moderately difficult activities, e.g. moving a table, bowling, playing golf	1	2	3
3. ... climbing several stairs	1	2	3

4. in the last weeks, have you worked less than you wanted because of your physical health?	yes	no
	1	2
5. in the last weeks, could you only do certain things because of your physical health?	1	2
6. in the last weeks, have you worked less than you wanted because of mental problems, e.g. because you appeared or felt anxious?	1	2
7. in the last weeks, were you unable to work as carefully as usual because of mental problems, e.g. because you appeared or felt anxious?	1	2

8. So far, has the pain hindered you in carrying out your daily home and professional activities during the last weeks?	not at all	a bit	moderately	fairly	highly
	1	2	3	4	5

9. How often were you calm and composed during the last weeks?	always	mostly	fairly often	sometimes	rarely	never
	1	2	3	4	5	6
10. How often were you full of energy during the last weeks?	1	2	3	4	5	6
11. How often were you <u>depressed and unhappy</u> during the last weeks?	1	2	3	4	5	6

12. How frequent has your physical health or mental problems affected your contact with other people during the last weeks?	always	mostly	sometimes	rarely	never
	1	2	3	4	5

Fig. 2: The SF12 questionnaire

20 subjects were included in this study. 10 patients in this group showed an exacerbated form of clinical course, whereas the remaining 10 patients showed a chronic progressive course. The mean age of the investigated patient group was 34 ± 12 years. Amongst the subjects studied, 16 patients (80%) were female.

An initial therapeutic cycle of ten treatments was designed for each proband. The therapy was carried out on a daily basis, except during the weekend. On average, the initial treatment comprised of 9 ± 2 individual treatments. Such a cycle spanned over an average period of 21 ± 9 days. The first-cycle treatment was performed in all 20 patients on the first day with 50% of the laser capacity for 20 minutes. On the next day, 75% of the laser capacity was used over 25 minutes and, subsequently, with 100% of the laser capacity over 40 minutes. The following cycles are orientated themselves on the individual clinical progress. If it led to deterioration, other treatments would be performed. A second cycle with an average of three treatments was required in four subjects (20%) after an average of 2.5 months. The treatment was implemented until deterioration was averted and a subjective improvement occurred. Two subjects received a third cycle with an average of 2.5 treatments after another two months. In one of these two patients, a fourth cycle of only one treatment was carried out after further two months.

The average follow-up of all subjects under study was 8 ± 3 months.

A preexisting immunomodulating therapy using interferones in eight subjects (40%) was continued unchanged in parallel. This immunomodulating therapy already existed for more than two years before the study in these eight subjects and was not changed before nor during the study as well as during the follow-up period.

Data survey and statistics

The data survey on quality of life was carried out using the “SF12 questionnaire on the general health condition”. This questionnaire is also a standardized system for the compilation of physical and psychological quality of life in MS. The SF12 was completed by the subjects before commencing and after terminating the first cycle. Another self-assessment was practiced every four weeks within the scope of normal consultations. A survey was carried out in turn during the treatment before and after the repeated therapy. By using this procedure, statements concerning the therapeutic effect are required to be facilitated directly after the treatment as well as during the long-term process. The statistical evaluation was performed by means of SPSS for Windows, Version 15.0 (SPSS Inc., USA). The continuous variables are shown as mean values, and the standard deviation was selected as a measure of variation. The continuous variables were validated by means of the Kolmogorov-Smirnov test with respect to their normal distribution. None of the tested variables demonstrated a normal distribution (Kolmogorov-Smirnov test: $p < 0.05$). Therefore, the t-test for paired random samples was used as a non-parametric test by comparing the means.

In contrast, the categorized data were evaluated by using the chi-square test and/or the exact Fisher test.

A two-sided significance testing was carried out in all tests, in which a p-value < 0.05 was considered as statistically significant for all statistical tests.

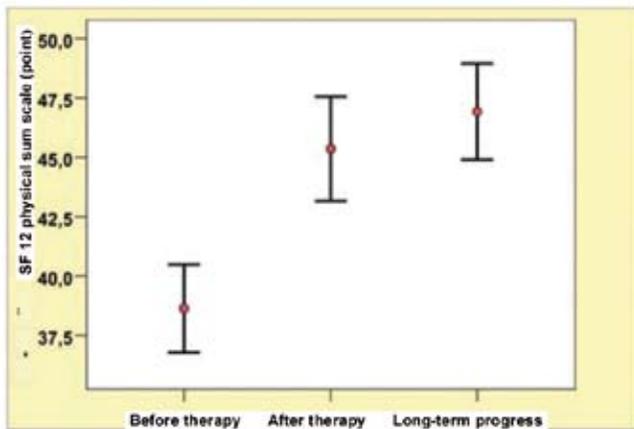


Fig. 3: Physical sum scale before and after the therapy. The mean as well as standard deviation is shown.

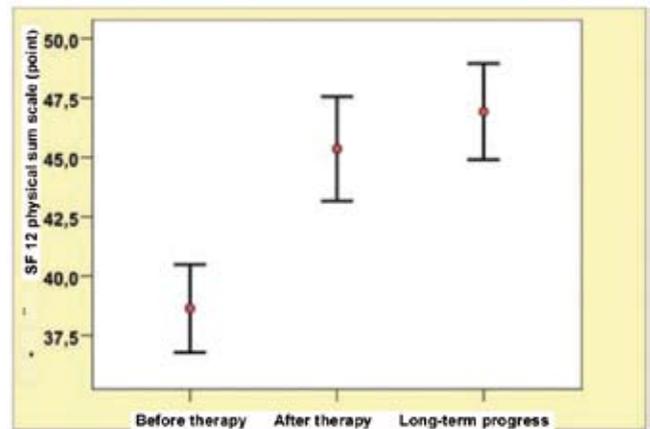


Fig. 4: Psychological sum scale before and after the therapy. The mean as well as standard deviation is shown.

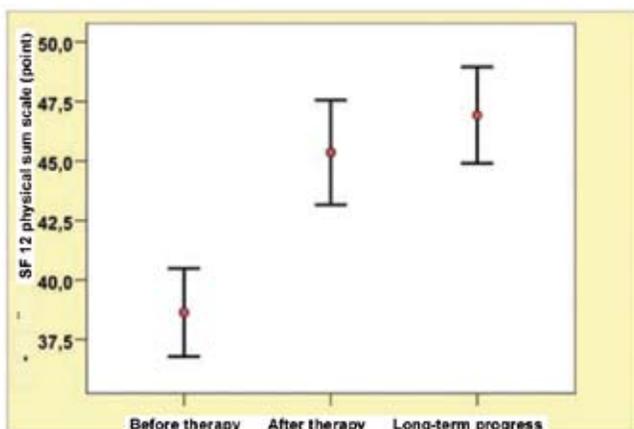


Fig. 5: Question 1 in SF12 – directly after therapy: “How would you generally describe your health condition?” The number of categories, in which the energy condition has changed, is shown.

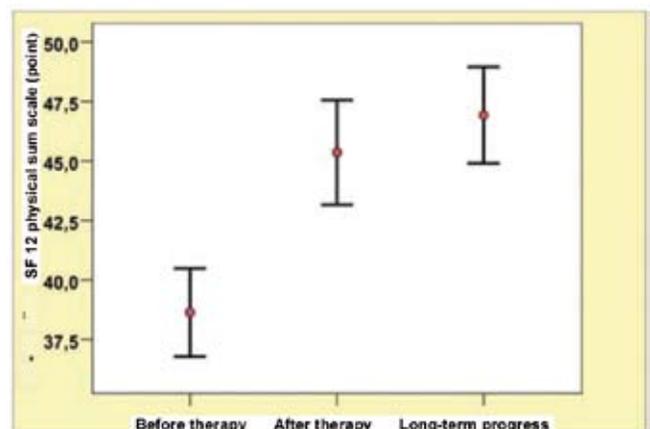


Fig. 6: Question 1 over a long-term process

Results

A significant improvement of the physical sum scale from 38.2 ± 5.8 points before the therapy to 43.4 ± 8.1 points could be obtained directly after the therapy ($p=0.002$) by means of laser treatment.

The psychological sum scale was also significantly improved from 28.6 ± 6.9 to 43.6 ± 13.0 points ($p < 0.001$).

A non-significant trend for further improvement of both scales could be observed during the long-term progress of both physical as well as psychological sum scales (physical sum scale = 46.9 ± 7.3 points; psychological sum scale = 47.6 ± 13.1 ; the p value was insignificant for both scales when compared to the scales directly after the therapy).

The evaluation of question 1 in SF12 according to the “general health condition” directly after the intravenous LB is shown in Fig. 5. Possible answers were “excellent” (Class 1), “very good” (Class 2), “good” (Class 3), “less good” (Class 4) and “bad” (Class 5). 15% of the subjects reported improvement at two classes directly after the intravenous LB cycles. In 35% of the patients, the

condition improved in one class. No improvement existed when determining the general health condition in 50% of the patients.

Figure 6 is a survey of question 1 on the long-term progress in the determination of the general health condition after the observation period has terminated. Improvements in four classes were reported in 10% of the patients (two subjects), a 50% improvement in two classes (ten subjects) and an improvement in one category of 20% of those treated (four subjects).

20% of the patients (four subjects) experienced no modification.

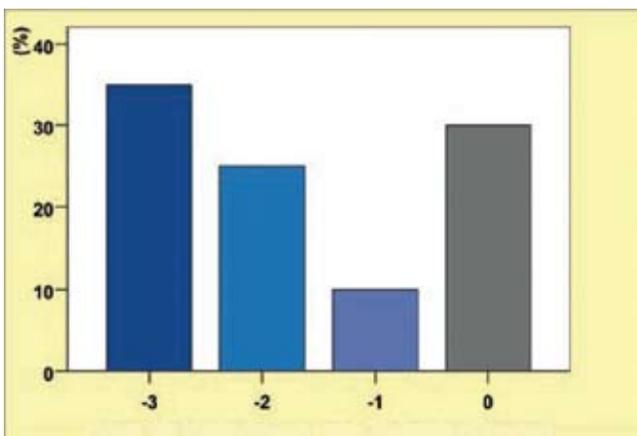
Question 10 of SF12 is: “How often were you full of energy in the last few weeks?” A possible answer was in the categories “always” (Category 1), “mostly” (Category 2), “fairly often” (Category 3), “sometimes” (Category 4), “rarely” (Category 5) and “never” (Category 6). In the evaluation of this question, Fig. 7 shows the LB influence directly after treatment.

In the survey of question 10, 35% of the subjects reported improvement of three categories directly after the laser cycle. An improvement in two categories was reported in 25% of the patients and an improvement in a category of 10% (two subjects). In 30% of those under study (six subjects), this led to no change in the energy condition.

Fig. 8 shows the influence of the intravenous LB on the survey of question 10 in the long-term progress. 55% of those surveyed (eleven subjects) reported improvement in three categories in the long-term progress, whereas improvement in two categories was in 15% of the patients. 30% (six subjects) reported no modification of their energy condition

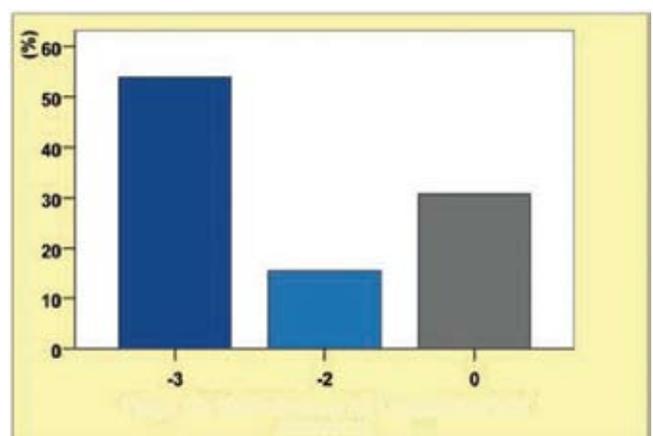
Discussion

The laser blood irradiation leads to a highly significant improvement in the quality of life in patients with Multiple Sclerosis. This concerns both the physical as well as the psychological sensitivity. A highly significant improvement was produced in both sum scales directly after terminating the laser cycles. Side effects were not observed. Side effects were also not observed by Gasparyan and Siposan et al.



Question 10: Changes after therapy (Classes)

Fig. 7: Question 10 in SF12 – directly after therapy: “How often were you full of energy in the last few weeks?” The number of categories, in which the energy condition has changed, is shown.



Question 10: Changes during the long-term process (Classes)

Fig. 8: Question 10 over a long-term process

The SF12 was used in the current study because both the physical condition as well as the psychological well-being could be determined. Approximately 70% of those afflicted with MS suffer excruciating severe exhaustion (fatigue syndrome). The LBI effect on this symptom could be evidenced in the current study using the deliberate representation of the changes in the evaluation of question 10 in SF12.

After the first laser cycle of an average of nine treatments was terminated, other treatments were carried out when a clinical deterioration reappeared. Fewer treatments were required to produce improvement in the subsequent cycle than in the first cycle.

The dosage of the following laser cycles must be performed individually depending on the experiments of the author. On a temporary basis, the patients specifically report a decreasing effect and this is noticed in their reduced physical and mental capacity and/or deteriorating quality of life. In the current study, the repeated treatment was always first performed after deterioration. Use of laser therapy is, however, already reasonable prior to the reduced effect. A long-term improvement in the quality of life might be possible using a regular treatment.

Conclusion

According to the experiments of the author, there is no established therapy available for successful treatment of the fatigue syndrome in MS-like conditions besides intravenous LBI. An interesting question in the future is whether the effect could still be elevated by using a different chromatic laser and simultaneous laser irradiation of head zones or in simultaneous laser acupuncture. Studies observing the exclusive LBI use without accompanying immunomodulating treatment are also meaningful. The current results within this context are expected to initiate further studies on large numbers of patients with a longer observation time. Thus, a compilation of the changes in the relapse rate and EDSS (Expanded Disability Status Score) is also possible.

8.6 Intravenous Laser Blood Irradiation in Sports Medicine

The Italian researchers Raggi and Vallesi performed a first study in athletes for investigation the effect of intravenous laser therapy on strength and endurance. The data were published in the journal "Schmerz & Aupunktur" in Germany 2008 [40].

Introduction

The idea to test the application of intravenous laser blood irradiation in sports medicine started in July 2007, when a young patient reported surprising effects since he had started the intravenous laser blood treatment.

He was a male, aged 34; he came for a problem of tinnitus. This problems developed 1 year before and he had undergone many diagnostic examinations (MRI, Doppler, CAT), but they were all negative. In the previous year, he had had a three months treatment with steroids without any success. He was not taking any drugs nor any kind of therapy at the moment he introduced himself.

The following treatment protocol was used:

- Intravenous Laser
- Laser shower (locally)

- Lipoic Acid (400 mg/die) and Ascorbic acid (100 mg/die), in order to enhance cellular metabolisms.

After a 10 sessions treatment, tinnitus was lowered (about 50%), but did not disappear. Nevertheless, the patient experienced some interesting and unexpected “side effects”: he said he was feeling less tired in the evening, that his sleeping was improved and he referred a better concentration during the day. But, what is very important is that he was an athlete (body building) and he had noticed that his maximum lifting power was increased, the running time in the training session was doubled and the number of swimming lanes in the training session was increased. Also his trainer was surprised by his improvements.

Many scientific papers have been written so far, showing biological actions and therapeutic properties of intravenous laser blood irradiation; this new medical technology is currently used for the treatment of different pathologies like rheumatic, cardiovascular, pulmonary and neurological diseases. But no scientific works have been performed, so far, about laser blood irradiation in sports medicine.

So it was decided to perform a short study, in order to confirm the effects that had been observed in this patient.

Materials and methods

Study population

4 male body building athletes were enrolled in the study. Mean age was 23,2.

Treatment protocol:

All athletes underwent 10 sessions of intravenous laser blood irradiation, with the following treatment schedule:

632 nm, 2 mW, 20 min. (first session);

632 nm, 2 mW, 20 min. + 532 nm, 2 mW 10 min. (9 sessions).

3 sessions per week were performed.

All athletes were invited to avoid any drugs or vitamins during the period of study.

Outcomes

The following outcomes were measured:

– Maximum strength tests:

1. Pectoral muscle maximum lifting power. Weight is lifted in the supine position, while athlete lies on the bench (Fig. 1). Maximum weight had to be confirmed by 8 following lifting of sub-maximal weight (80% of maximum).

2. Weight lifting from the floor. Weight is on the floor and athlete has to lift it from standing position (Fig. 2). Maximum weight had to be confirmed by 8 following lifting of sub-maximal weight (80% of maximum).

3. Squat. Weight is put on athlete’s shoulders and athlete has move down and up, once. Maximum weight had to be confirmed by 8 following lifting of sub-maximal weight (80% of maximum).

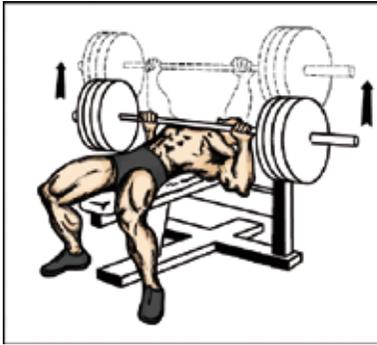


Fig. 1 – Pectoral Muscle maximum lifting power

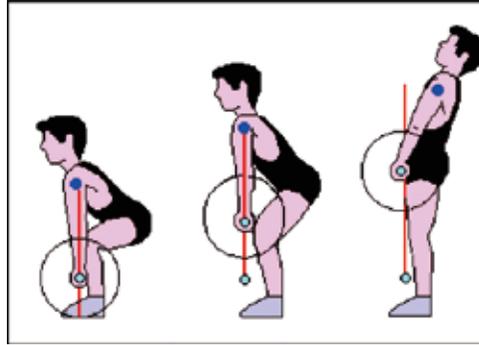


Fig. 2 – Weight lifting from the floor

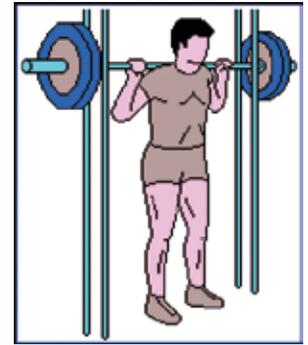


Fig. 3 – Squat

– Endurance tests:

1. Nr. of swimming lanes:

is the maximum number of swimming pool lanes that athlete could perform until he felt tired. This test is not time dependent.

2. Cord jumping:

is the maximum time that athlete could perform in cord jumping until he felt tired

Measurements:

All athletes were evaluated in 8 different times of the period of study:

1. before the treatment,
2. after the treatment,
3. every 4 weeks after the end of the treatment.

Results

Mean pectoral muscle maximum lifting power at any time of measurement is shown in Fig. 4.

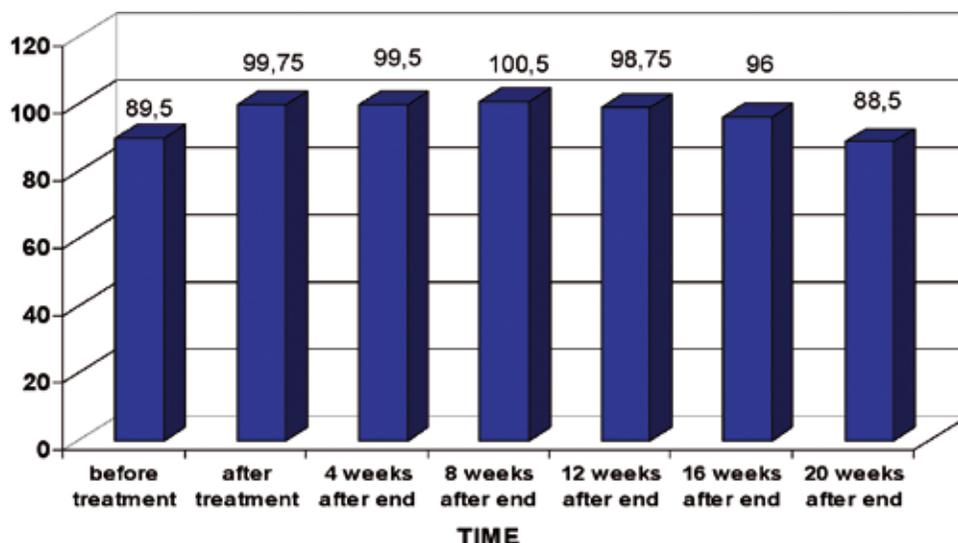


Fig. 4 – Mean pectoral muscle maximum lifting power (Kg) at any time of measurement

Mean value seems to increase immediately after the treatment and this effect seems to last for 16 weeks; after words, it seems to disappear and previous condition is restored. This trend is shown in Fig. 5, where mean pectoral muscle maximum lifting power percentage variation is reported.

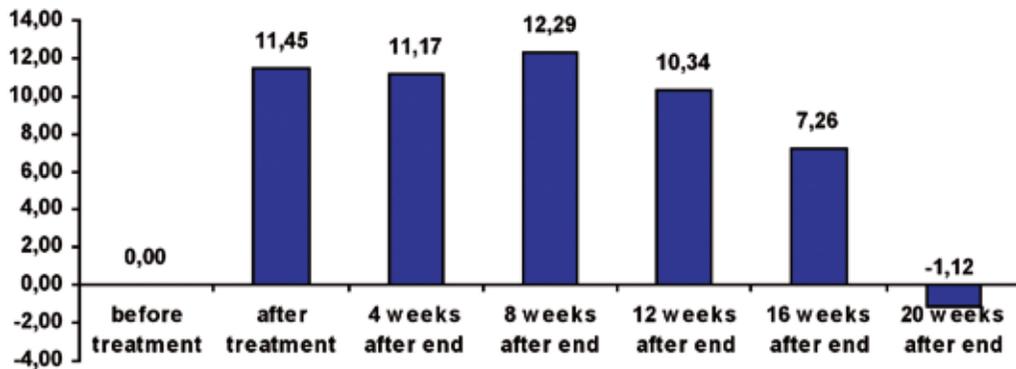


Fig. 5 – Mean pectoral muscle maximum lifting power percentage variation at any time of measurement

Very similar results were obtained in all the other tests that were performed (See Fig. 6-9).

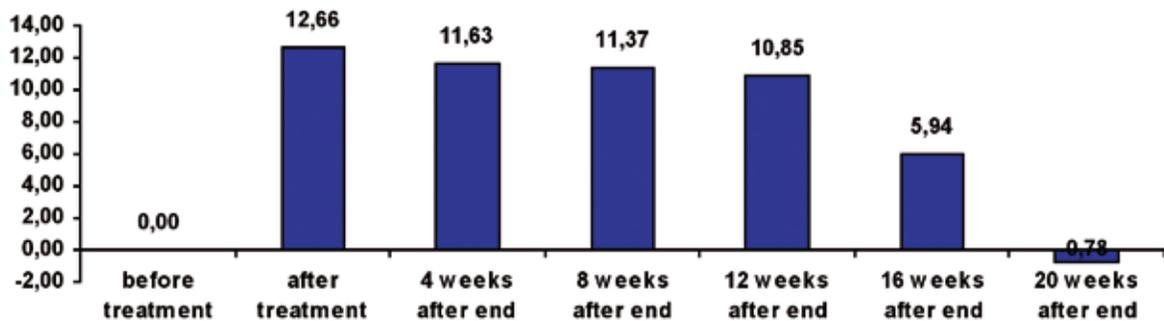


Fig. 6 – Weight lifting from the floor: mean percentage variation at any time of measurement

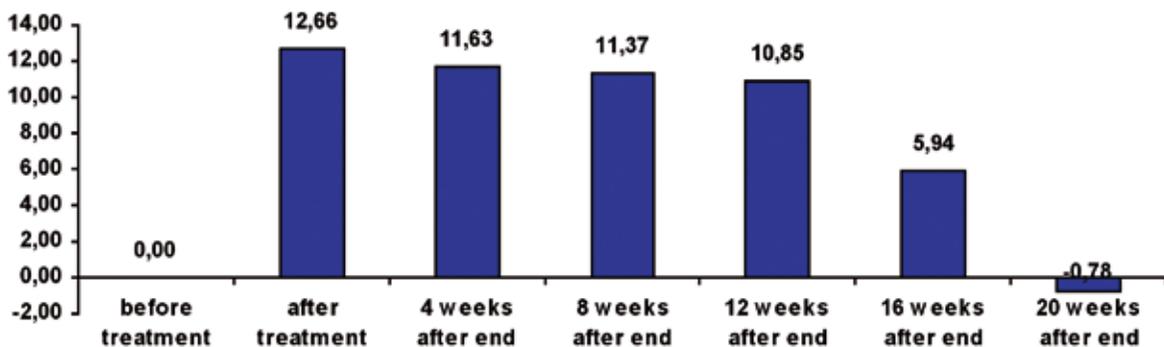


Fig. 7 – Squat: mean percentage variation at any time of measurement

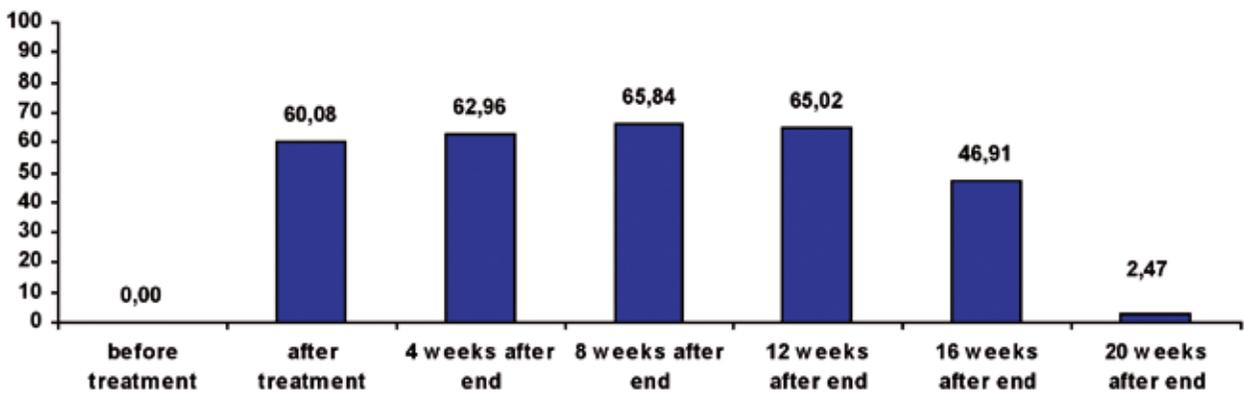


Fig. 8 – Number of swimming pool lanes: mean percentage variation at any time of measurement

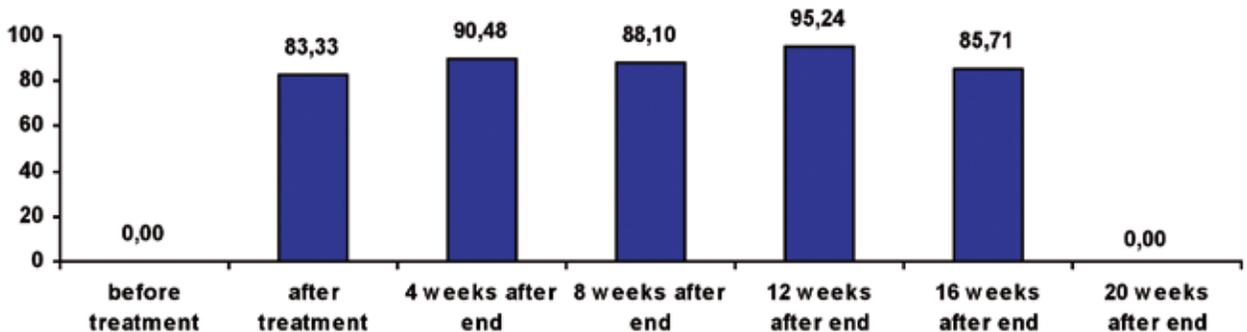


Fig. 9- Cord Jumping time: mean percentage variation at any time of measurement

Discussion

In this study intravenous laser treatment seemed to be effective in sports medicine; even though it is to highlight that the number of cases was very small. Furthermore, there is big lack of data from the literature on this topic and further studies are needed in this field.

In all the athletes in the study, the muscular empowerment appeared to last for 16 weeks after the end of the treatment. Despite this data have to be confirmed in bigger studies, it can be hypothesized that it is related to the erythrocytes' mean living time: 12-15 weeks. One can imagine that, after a complete cycle of treatment, all circulating red blood cells are "activated"; since they have different "ages", they will survive for different times; but, in any case, the youngest among them will disappear from circulating blood after about 15 weeks and, after that, the therapeutic effect will be lost.

In order to verify the plausibility of these findings, a deep review of the medical literature on Low Level Laser Therapy (LLLT) is necessary. The review was conducted looking for "low level laser blood irradiation" in the Pub Med Library. Only articles related to the topic of sports medicine were considered.

First of all a polish study can be mentioned, showing higher exercise capacity, longer exercise time and longer distance of 6 minutes walk test, in 39 coronary artery disease patients, treated with LLLT on the chest area.

In a second study, isolated rat tibial anterior muscle was fatigued with electric current until initial strength was lowered to 50%. Then, the rats were divided into two groups: LLLT treated group and a control group. Laser irradiated group had significantly longer time to reach 50% reduction of strength, significantly higher peak force and significantly lower creatine kinase blood levels (muscle damage index).

So it can state that the outcomes observed in presented study could be considered plausible, if compared to other studies showing biological properties of LLLT.

But the way how these effects are achieved still remains unclear.

Many studies show various biological effects of laser irradiation, related to the presented topic.

A very important effect is the blood flow increasing. A Japanese research group performed LLLT on common carotid artery area: blood flow volume in central retinal artery and ophthalmic artery increased.

A similar experiment was carried out by Makihara et al: LLLT on right temporomandibular joint area yield expansion of blood vessels and increase in blood flow volume in superficial temporal artery; surprisingly, this effect was observed bilaterally.

Wasik et al, observed PO₂ and SaO₂ increasing, after whole blood sample irradiation with 632 nm laser.

Other important referred effects are increased erythrocytes' deformability and microcirculation enhancement.

But which are the possible molecular mechanisms, explaining the above cited effects?

Mittermayr et al showed that blue laser releases Nitric Oxide (NO) from Haemoglobin (Hb). NO-Hb is a form of met-Hb, with low O₂ linking power. So, free NO released from Hb is a powerful molecule producing vasodilatation and perfusion enhancement; at the same time, Hb O₂ linking power is increased.

Besides, irradiation of monocytes leads to increased NO levels from a preformed store, without activation of NO synthesis and releasing of endothelial NO.

In a study performed by Simonian et al, isolated erythrocyte membrane was irradiated and Cit b 558 III activities was measured; Cit b 558 III is a membrane enzyme that restores met-Hb (H⁺-Hb, CO₂-Hb, DPG-Hb) to normal Hb, with higher O₂ linking power. Cit b 558 III activity was enhanced after laser irradiation.

In conclusion, the data from the literature review seem to confirm the plausibility of the presented results, even though obtained from a very small study population. We hope that the preliminary data on intravenous laser therapy and sports medicine will contribute to focus the attention of many researchers on this interesting topic, so that deeper scientific knowledge could be achieved. Especially for the last question that still is without an answer: why the effects of blood irradiation are systemic and not only local?

8.7 Intravenous laser therapy in fibromyalgia pain

In 2008 the anaestesiologist Wieden published a new study [56] performed in the pain centre of Celle in Germany.

Fibromyalgia is one of the most common chronic pain disorders. In Europe, the assessments for

a disorder rate range between 10 and 13%; in the United States of America, this proportion is merely 2%. Women, who mostly have the onset of disease between 20 and 35 years of age, are predominantly affected at a ratio of 8:1.

The term fibromyalgia is derived from its components, *fibra* = fibre, *myos* = muscle and *algos* = pain and, therefore, its naming already indicates the localisation of the complaint.

Symptoms

The onset of the diseases mostly occurs subtly as unspecific symptoms, exhaustion and sleep disorders; gastrointestinal tract symptoms also arise at a later stage. A typical pain first develops in the arms and legs after a latency period, later they are also distributed over the torso.

When the full disease is acquired, it is common that seven to eight years expire before the syndrome will have spread from depressive alienation to manifest depression and partially severe vegetative disturbances. Organ or tissue damages are also undetectable by sweeping diagnostic measures and procedures, which also leads to stigmatism of the affected patients.

- Initial unspecific complaints, exhaustion, sleep disorders.
- Morning stiffness, subjectively sensitised swelling of the hands, arms and legs.
- Subjective discomforts, such as pins and needles as well as numbness predominantly in the hands.
- Nervous extremities (restless legs), spasms in the leg musculature.
- Tense headaches in the temples and occipital region.
- Violent pain attacks interspersed with periods that show little pain or are even painless.
- Chills, wetness or external stress that leads to aggravation.
- Hoarseness, difficulties in swallowing, lumpy sensation in the throat, ear ringing (tinnitus).
- Cardiac rhythm disturbances, dyspnoea
- Gastrointestinal disturbances, irritable bladder.
- Sensitive skin, alopecia, increased perspiration.
- Fatigue and incapacity.
- Severe physical and mental exhaustion after mild exposure.
- Rare somnolence, frequent hypersomnia.
- Cognitive and concentration disturbances, depressive alienation.
- Tendency to develop intolerance and pseudo-allergies.
- Reduced sexual interest.

Causes

The cause of the symptoms is unknown; indications of infectious, immunological or hormonal imbalance are being discussed. To date, the theory of experiencing an infectious disease caused by Streptococci or Borrelia could also neither be confirmed nor contradicted. In terms of energy, evidence is traced to a genetic contribution. Therefore, in affected patients, significant mutations at chromosome 22 (COMT-GEN, position 158 Val/Met), which have also been established in the

ADHS hyperactivity syndrome, could be proven. These probably lead to cognitive alteration and, finally, also to a related increase in the subjective pain sensation.

It remains unclear why in these observations it regularly leads to premature exhaustion in the physical capacity. In this case, psychological reasons are predominantly discussed.

Therapy

Since the diagnosis of the condition proceeds mainly at a late stage due to the subtle progress, besides the specific symptoms of the disease, the subsequent damages of the chronification, that has already occurred, are also frequently relevant and, hence, subject to therapy. Physical permanent damage and signs ranging from medication abuse to addiction are commonly manifest due to long-term medical treatment with different pain-killers.

A causal therapy in accordance with generally valid standards or directives is currently unfeasible; however, different aspects are advocated within the scope of a multimodal therapy:

- Economical use of conventional analgesics such as NSAR.
- Abstinence from opiates, especially at stage III as according to WHO in order to prevent the euphoric side effects or perceived sleep inducement.
- Antidepressive therapy using tricyclic or modern serotonin reuptake inhibitor.
- Antineuropathic treatment by Gabapentin or Pregabalin
- Cryotherapy (cold room), physical therapy.
- Muscle relaxation and lymph drainage.
- Psychotherapeutic and psychosomatic concomitant treatment for systematic stress intensification.

Pathophysiological considerations

Fibromyalgia is expressed – as considered from a purely physical aspect – by pains and rapid exhaustion of the muscle system, even after mild exertion. If the muscle structure is taken into consideration, then this exists as individual fibres made from a multitude of myofibrils, which – for their part – consists of individual actin filaments bound to one another and interspersing myosin filaments.

The muscle contraction is achieved by the filament sliding over one another, which is accompanied by a corresponding muscle shortening. The precondition for this process is a constant supply of adenosine triphosphate (ATP), which is stored in the mitochondria, which are specific to the muscles. The energy obtained from ATP is simply sufficient for a few muscle contractions. If the supply is depleted, the muscle cell searches for other energy sources: creatine phosphate (CP) is first used as a resort, by which the energy-deficient adenosine diphosphate (ADP) is converted to ATP, which is essential for energy delivery when the demand is persistent. If creatine phosphate is also dwindling, the anaerobic metabolism – instead of the current aerobic metabolism – becomes effective. During this process, the muscle cells acquire ATP, by which glucose is converted to lactic acid (lactate), which accumulates in the muscle fibres and finally leads to acidosis and constant pain.

The energy balance resulting from this process may not cover the demand permanently: whereas 38 ATP molecules exist in aerobic metabolism of one sugar molecule, the anaerobic conversion simply brings about the formation of 2 ATP molecules from a sugar molecule. It leads to a constant

energy deficit.

If it is considered that even the muscle fibre tension is an energy-consuming process, it is obvious that in the worst situation, oxygen demand of the muscle is not in a resting position or only insufficiently achieved. The result is a constant energy crisis of the musculature system with permanent contractions, continuous pain and formation of “hot spots” supplied with a minimum amount of blood, the triggering or even the tender points which are pathognomic for fibromyalgia.

Implications for fibromyalgia therapy

The disturbed energy balance of the muscle is successfully improved by a suitable process if the continuous contractions and, therefore, constant pain were also required to be alleviated. It is known from sports sciences that the performance of sports persons is improved by laser light irradiation that targets the muscular system. If this technique is supplemented by additional acupuncture at acupuncture points relevant to fibromyalgia and the energy yield of this process increases by intravenous laser irradiation of the mitochondria located in the blood cells, a minimum adjuvant process would also be found for the treatment of fibromyalgia.

The objective of a current observation, therefore, should be the documentation of the fibromyalgia symptomatology by combining intravenous laser application, laser irradiation of the muscles and laser acupuncture.

Data sheet: M. Mustermann, born on 16.05.1942

- **MPSS: chronification stage 3 is present at the time of the initial study.**
- **Last psychological test: highly affective pain evaluation**
- **Special points of note: high depression value**

Onset : 2008		Quarter:																	
Psychological test	Pain scale	Value: 0 up to 10	6																
	Well-being	Value: 0 up to 10	3																
	Confinement (PDI)	Standard value: up to 5	8.0																
	Veg. score (von Zerssen)	Standard value: M<24,F<28	42																
	Affective components	Standard value: up to 42 P	49																
	Sensory components	Standard value: up to 42 P	22																
	A-SES / S-SES Quotient	Standard value: up to i	2.2																
	Depressivity (ADS)	Standard value: up to 23 P	38																
Therapy schedule	Meaningful addictive/ withdrawal behaviour																		
	Phamacotherapy		X																
	Therapeutic localised anaesthesia																		
	Invasive procedures																		
	Acupuncture		X																
	Physiotherapy																		
	Psychotherapy		X																
	Social work																		
	Other		X																
Stationary therapy																			

Fig.: Regular psychological pain profile given at the beginning of the therapy and in other processes.

The pain center Celle is a facility, in which only patients suffering from chronic pain disorders have been treated by multimodal and interdisciplinary directives for more than 10 years. Besides processes involving medication, practically all interventional and many complementary therapy forms are also applied. Another focal point is the traditional Chinese acupuncture, which is also applied to a wider extent in accordance with the directives of the “Bundesärztekammer” (Federal Medical Board), corresponding to the indication list of the World Health Organisation (WHO).

All patients experience an intensive initial survey as well as a standardised process control, which also includes a psychological pain profile. The previous as well as current pain extents, pain disability index (PDI), sensory and affective components, the von Zerssen vegetative score, the depression index (ADS) as well as the Gerbershagen chronification stage are also documented in all patients.

Axis	Item	Description	Value		Stage				
1	Temporal aspects	Frequency of incidence	Once per day or rarer	3	7	3	Total of axial stages		
			Several times per day					2	
			Permanent					3	
	Duration	Up to several hours	3						
		Several days		2					
		Longer than one week or permanent		3					
	Intensity change	Frequent	1	1					
		Occasional						2	
		Never						3	
2	Spatial aspects	Monocular	3	3	3	Total chronic stage (MPSS):			
		bilocular					2		
		multilocular or panalgesia					3		
3	Med. consumption behaviour	Medication consumption	Irregular consumption of a max. 2 peripheral analgesics	1	2		1		
			max. 4 peripheral analgesics, maximum of 2 regular					2	
			Regular, more than 2 peripheral Analgesics or analgesics affecting the central nervous system					3	
		Number of withdrawal treatments	none	1				1	
			one						2
			More than one withdrawal treatment						3
4	Patient medical history	Change of family doctor	No change	3	3				
			max 3 changes			2			
			More than 3 changes			3			
		Hospital stay caused by pain	Up to 1	2					
			2 to 3			2			
			More than 3			3			
		Operations due to pain	Up to 1	1					
			2 to 3			2			
			More than 3			3			
		Rehabilitation measures due to pain	None	3					
			Up to 2			2			
			More than 2			3			

Fig.: Census of the Gerbershagen chronification index at the onset of the disease.

Methodology

In the observed patients fibromyalgia has been diagnosed by the centre director either as a primary disease or as a reactive disorder accompanied by other pain conditions. Overall, 246 patients, who have received medication treatment as well as physical therapeutic procedures and, if necessary, psychotherapy or conventional acupuncture, could be reprocessed within the scope of a retrospective

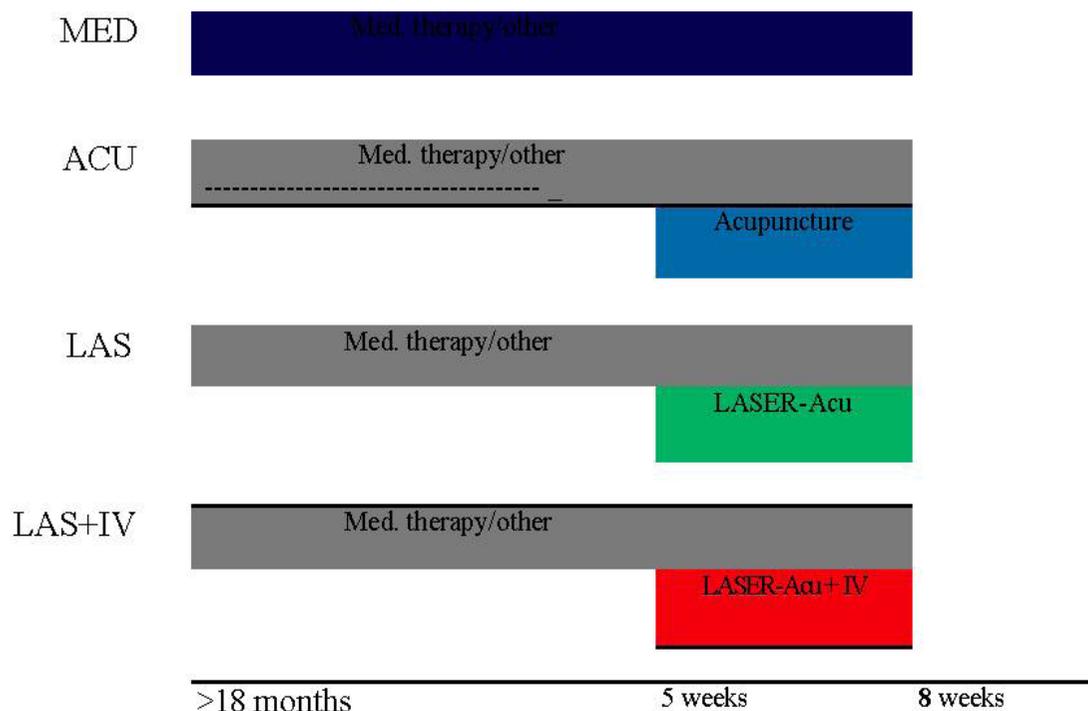
view.

The average duration of an illness was 8 years; an average 6 pre-therapy experts have performed medication procedures (99%), physical therapy (86%), psychotherapy (22%) or other procedures (20%).

In another group, 82 patients have also been treated with the procedures mentioned above, using acupuncture.

From the prospective side of the observation, 72 patients have received laser treatment either as a purely percutaneous therapy at specific acupuncture points or as a combined procedure using intravenous blood irradiation.

The Webermedical weberneedle® blood system is applied successfully as a LLLT, using red-laser (632 nm) and green laser (532 nm) irradiation as well as the percutaneous application of a weberneedle® acupuncture laser needle appliance from the same company, which consists of 6 red-light and 6 infrared laser diodes. Each patient received 10 acupuncture laserneedle treatments as well as a minimum of three intravenous irradiation operations in the pertinent observation group. The treatment duration was limited to five weeks.



Therapy structure: All patients have received the customary medication procedure (MED), a number received an additional needle acupuncture (AKU) or laser acupuncture (LAS) or a combination of laser acupuncture and intravenous laser irradiation (LAS+IV).

Observations

The symptoms of “pain”, “vegetative disorder” and “depression”, which are related to the fibromyalgia syndrome, should be provided as examples in this situation.

Pain

During treatment, the average pain intensity decreased significantly on the visual analogue scale (VAS) in all treatment groups as compared to the initial study, in which the pain characteristic showed the minimum value in the group, which was also treated with laser light.

	Onset	End
MED	8.7	6.8
ACU	8.5	6
LAS	8.5	4.4
LAS+IV	8.9	2.9

MED = medication procedure, ACU = needle acupuncture, LAS = laserneedle acupuncture, LAS+IV = combination of laserneedle acupuncture with intravenous laser irradiation.

Pain Disability Index

Within the scope of the von Zerssen vegetative score, vegetative disturbances, such as excessive perspiration, tachycardia, globus sensation, etc., have been claimed to have undergone significant improvement due to all acupuncture treatment with and without laser as compared to the initial study, in which the medication treatment only led to a marginal change of the original value.

	Onset	End
MED	54	51
ACU	48	36
LAS	49	35
LAS+IV	52	22

MED = medication procedure, ACU = needle acupuncture, LAS = laserneedle acupuncture, LAS+IV = combination of laserneedle acupuncture with intravenous laser irradiation.

Depression Index

The frequently occurring depression accompanying fibromyalgia decreased most significantly especially in groups treated with laserneedle acupuncture or a combination of laserneedle acupuncture and intravenous laser irradiation.

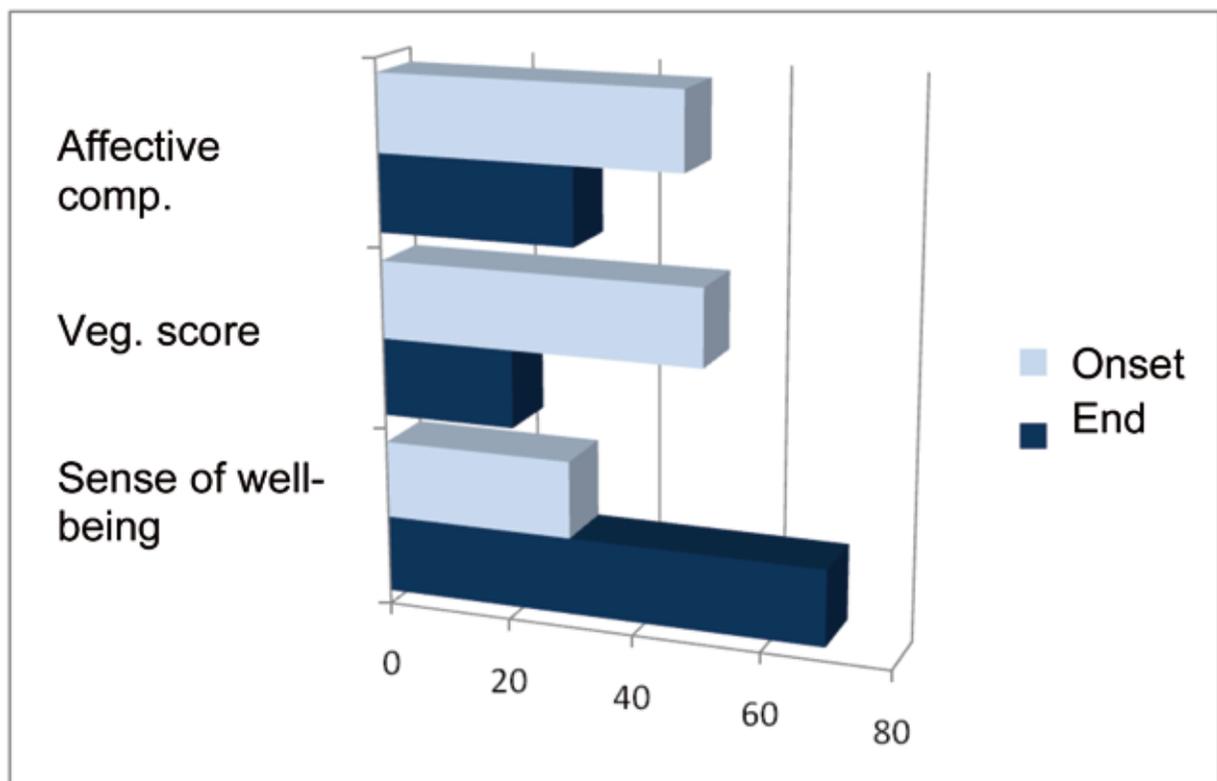
	Onset	End
MED	34	23
ACU	37	24
LAS	42	12
LAS+IV	40	12

MED = medication procedure, ACU = needle acupuncture, LAS = laserneedle acupuncture, LAS+IV = combination of laserneedle acupuncture with intravasal laser irradiation.

Complete Overview of Laser Acupuncture with Intravenous Laser Irradiation

When measured on the score estimated by the patients themselves for affective and vegetative adverse effects as well as for their general well-being, all values of the combined laser treatment after five weeks showed a significant improvement when compared with those at the beginning of the therapy.

	Onset	End
Sense of well-being	30	70
Veg. score	51	21
Affective comp.	48	31



Conclusions

The current procedures to treat fibromyalgia primarily consist of medication, physiotherapeutic and psychological therapeutic forms, which cannot always achieve a significant reduction of the symptoms; however, from experience, they mostly prevent aggravation. According to the classical Chinese model, the needle acupuncture treatment represents another option to limit the individual symptoms. By observing the individual patient groups, however, a slightly limited tolerability of the pain stimuli associated with the application was often produced. According to references as well as the very needle treatment experiments, even better results are achieved in a comparative manner and to a certain extent by using laserneedle acupuncture treatment. The intravenous blood irradiation using red light and green lasers has also been capable of accomplishing a significant advantage in the symptoms of the condition, which especially affect the patients.

This is especially demonstrated in the general well-being, which improved by approximately a factor of 3. An energetic concentration of the cell lines present in blood and the accompanying

improvement and acceleration of ADP conversion to ATP seems to have considerable effects both in the muscular system as well as in other different factors.

The observations presented in this work do not fulfil the prerequisites for a controlled application observation or for a treatment study. However, they show a significantly positive trend for a clinical record that is only otherwise difficult to treat. Therefore, the contents of further studies are required for the processing of a stringently prospective representation in the treatment process of fibromyalgia using controlled methods.

8.8 Study of the Efficacy of Low level laser in Myocardial Perfusion of Patients with Chronic Stable Angina

In November 2008 a new study on heart patients was presented on the congress of the Iranian heart association in collaboration with the American college of cardiology by

F. Noohi, MD. FACC , M. Javdani, MD*, M. kiavar, MD Shaheed Rajaei Cardiovascular Medical & Research Center. IRAN University of Medical Science, Tehran, IRAN.

Background:

In the vast majority of patients with angina pectoris caused by underlying coronary artery disease, effective treatment is available. Most patients respond to antianginal medication, and for the remainder either percutaneous coronary Revascularization or coronary artery bypass grafting can be performed. (1)

Low-energy laser radiation through its direct influence on tissue repair processes without heating effect may have vital importance in the therapy of patients with advanced coronary artery disease (CAD).(2)

The purpose of the study was to assess the safety and efficacy of low energy laser therapeutic procedures in patients with advanced multi-vessel CAD not suitable for myocardial revascularization. Many clinical parameters as well as results of laboratory tests were evaluated to find any indices of potential impact of the laser therapy in the examined population.

Method:

22 patients with advanced CAD were assigned (mean age 61, male gender 68.1%, 100% with history of myocardial infarction), to undergo two sessions of irradiation of low energy laser. Each session was 10 time and each time of radiation was 20 min. Pre laser evaluation was included, blood pressure, heart rate, basic biochemical test , ECG, 6 minute walk test, TTE, gated MPI. Before the first and the second period of laser therapy with 3 months break pre and post laser parameters, were measured.

Results:

No side effects associated with the laser biostimulation or performed clinical tests were noted. Improvement in SBP, Higher functional class, longer distance of 6-min walk test in both group were noted. There was significant change in myocardial perfusion of most anterior segments of heart by single photon emission computed tomography (SPECT) (visually and by computer software)($P < 0.05$). There was no significant change in DBP, HR, and in LVEF by TTE and gated MPI.

Conclusion:

An improvement of functional capacity and myocardial perfusion and less frequent angina symptoms during 6-min walk test, without significant change in left ventricular function by TTE and gate MPI, were observed. Low level laser in short term was a very safe method. These encouraging results should be confirmed in a larger, placebo-controlled study.

8.9 Intravenous laser blood irradiation in oncology

The German oncologist Frank Andrae tried to show the effects of the intravenous low level laser on oncological patients and published a first article in 2007 in the German Journal of Oncology [1]. He compared the effect of the Tallberg bioimmune therapy with the intravenous laser and showed that a combination of both methods was most effective in the treatment of oncological patients with different tumours.

Intravascular laser blood irradiation and the bioimmunotherapy according to Tallberg appear to have additive and synergistic effects in the redifferentiation of tumour cells. The bioimmunotherapy exerts effects on tumour cell mitochondria. By means of mitochondria-nuclear communication malignantly transformed cells can regain their normal gene expression. Intravascular laser blood irradiation changes mitochondria morphologically and activates metabolic energy processes. In an application study these two methods were compared with each other both individually and in combination in maximally chemotherapeutically pre-treated tumour patients. Clinically and morphologically synergistic and additive effects were observed.

In the 1950s many articles were published on therapeutic experiments with mitochondria, including tumour mitochondria. The results of these papers point in the same direction: To restore normal mitochondrial function or an application of healthy mitochondria means a regeneration impulse for degenerated cells and could assume a key position in the treatment of chronic and progressive diseases. The bioimmunotherapy according to Tallberg, in which amino acids and trace elements in individual concentrations and in accordance with a tumour specific code are administered, functions in accordance with this principle.

Tallberg proved experimentally that tumour cell mitochondria modify their morphological structure on application of special amino acid/trace element mixtures and clustered around the cell nucleus of transformed cells, partially penetrated into it, and apparently via the paths of mitochondria-nuclear communication effected a normalisation of gene expression and thus a cell redifferentiation to normal body cells or induced apoptosis². The redifferentiation process progresses in three phases: Proliferation reduction, proliferation inhibition and complete degeneration of the tumour tissue. However, since this process takes months to years, the therapeutic concept of tumour redifferentiation therapy should be further optimised by integrating additional procedures such as intravascular laser blood irradiation.

Laser blood irradiation activates metabolic processes

Intravascular laser blood irradiation has been applied and systematically studied for decades in the former Soviet Union and indeed for chronic diseases such as Diabetes mellitus, liver diseases, cardiac and renal insufficiency. In the relevant literature it has been e.g. reported that as a result of laser blood irradiation mitochondria are morphologically altered and metabolic energy processes are activated. This method allows the mitochondria of human lymphocytes to morphologically form so-called "giant mitochondria" (these are reactive phenomena, and in no case pathological giant chro-

mosomes, such as those described in diverse degenerative diseases) and simultaneously the ATP and RNA synthesis rates increase significantly. In the process, cells with a low (acidic) pH and hypoxia are said to react better than normal cells. Based on this data, we presumed that the laser blood irradiation and the bioimmunotherapy according to Tallberg exerted similar or equivalent target functions on tumour cells and that synergistic or additive effects could be achieved.

Materials and methods of AWB

Seventeen patients with advanced metastatic carcinomas of different tumour entities were treated. All patients had been pre-treated; the conventional treatment was considered to have been completed at that time. Clinically, the patients were in acceptable condition; they were mobile and stable with regard to their haematological situation (Hb, Hkt, thrombocytes, leukocytes, etc.).

The patients were divided into three groups:

n Group I: Five patients received an intravascular laser blood irradiation.

n Group II: Five patients were treated with bioimmunotherapy. Clinically proven formulation mixtures plus phospholipids from animal brain tissue (so-called neurofood) plus vaccine from the patient's own tumour tissue (for detailed information, see Tallberg).

n Group III: Seven patients were concurrently treated with intravascular laser blood irradiation and bioimmunotherapy.

Intravascular laser blood irradiation

The "Weberneedle blood" unit with red light laser, 5 mW, 632 nm, continuous irradiation (Weber medical GmbH, D-37696 Lauenförde) was used. 10 x laser blood irradiation of 30 minutes duration. Treatment frequency: twice every week

Application location: Left cubital vein.

Laboratory parameters

Initially and at the end of each five-week observation period examinations were performed to detect the presence of circulating atypical cells, determine their quantification and morphological comparison examinations of the tumour cell mitochondria (subsequent to fluorescent labelling) under a laser scan microscope (= high-resolution morphology). Weekly determination of the relevant tumour markers and examination of a native blood smear with laser scan microscopy to depict immunocomplex aggregates adhering to the erythrocyte membrane (Fluoview, Olympus, x 30,000).

Isolation, identification and semi-quantification of circulating atypical cells

In each case 50 ml of fresh heparin blood. PBS centrifugation to separate mononuclear cells. Multiple washing, pelleting and resuspension as well as transfer to a cell culture medium (MEM plus glutamine solution plus foetal bovine serum). Duration of culture 2 to 3 weeks at 37° C, under CO₂. Immunocytological examination and, if necessary, DNA cytophotometry. Quantification in a Neubauer counting chamber (Fig. 1).

Laser scan microscopy

Typically, plasma proteins are adsorbed onto the erythrocyte membrane. They are not visible in

conventional light microscope, but can be discerned in the high-resolution laser scan microscope (Fig. 2). Malignant cells produce abnormal proteins, which in turn stimulate B cells to antibody formation. As a consequence immunocomplex aggregates which have a high affinity for the erythrocyte membrane. As a result of the absorption of such immunocomplex aggregates on the erythrocyte membrane and simultaneous desorption of the physiological membrane-bound plasma proteins, characteristic images are formed which gradually demonstrate the deviations from the immunologically normal findings. The deviations from normal findings are assigned a diagnostic score of 0 to 30, where a score of 30 indicates a maximum on atypia.

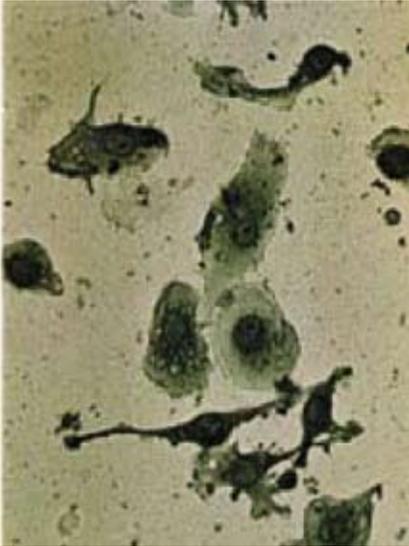


Fig. 1. Typical tumour cell culture

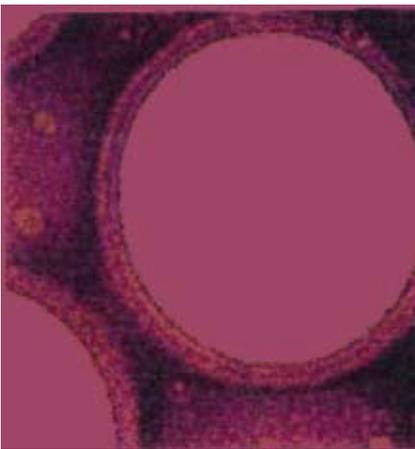


Fig. 2. Normal finding: Erythrocyte with adsorbed plasma proteins

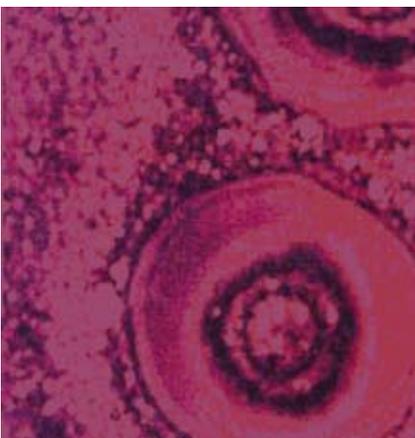


Fig. 3. Pathological finding: Immunocomplex aggregates, desorption of the plasma protein zone and apposition of metalloproteins in the pallor region.

Application study confirms the effect of the laser therapy

The important examination results are presented in the following tables. The comparative morphological examination of the tumour cell mitochondria yielded conformity of changes in the mitochondrial morphology in all three groups. Tumour-specific modifications of the mitochondria occurred, which possibly allow new diagnostic approaches. A comprehensive report on this will be published separately in the near future.

CONCLUSION

Based on diverse information in the literature, we expected that intravascular laser therapy could be effective in the scope of a redifferentiation therapy. This assumption appears to have been confirmed by the results of our application study. Merely as a result of the sole application of intravascular laser therapy, the quantity of circulating tumour cells was reduced and the patient's pathological immune response modulated in the direction of the standard. The bioimmunotherapy according to Tallberg was even more effective in the comparison. Both procedures applied simultaneously obviously exhibit synergistic and possibly also additive effects. We presume that the intravascular laser therapy, like the bioimmunotherapy according to Tallberg, influences the mitochondria-nuclear communication by means of a direct effect on the mitochondria, and that malignantly transformed cells redifferentiate to normal somatic cells or transition into apoptosis (additive effect) In addition the known positive immunomodulatory effects of this therapy are likely to be of additional importance (synergism). Our patients were all chemotherapeutically maximally pre-treated and have additionally responded well to the intravascular laser treatment. The use of intravascular laser blood irradiation can therefore also be appropriate during conventional oncological treatments. On the basis of the existing data, it can be assumed that the efficacy of chemotherapy (induction of tumour cellular apoptosis) can be increased as a result of intravascular laser therapy. Further investigations are planned in this regard.

Group 1: Laser therapy

Type of tumour	TZ	LSM1	LSM2	LSM3	LSM4	LSM5	TU marker
Squamous cell cancer /ENT	-25%	26	17	14	6	4	SC : negative CEA : -9%
Adeno cancer colorectal	-10%	30	26	18	11	8	CA 19-9: -8%
Mucinous ovarian cancer	-11%	30	24	22	15	11	CA 72-4: -12%
Adenopapillar urothelial cancer	-9%	28	22	14	14	11	TPA : -6%
Hepatocellular cancer	-12%	24	24	21	19	14	AFP : -13%

Group 2: Bioimmunotherapy

Type of tumour	TZ	LSM1	LSM2	LSM3	LSM4	LSM5	TU marker
Hepatocellular cancer	-70%	22	20	12	11	2	AFP : -22%
Ductal breast cancer	-28%	28	22	14	2	4	CA 15-3: -64%
Prostatic cancer	-35%	30	30	12	11	4	PSA : -24%
Prostatic cancer	-64%	17	12	11	5	0	PSA : -48%
Lung cancer	-53%	30	25	17	14	2	CYFRA 21-1: -34%

Group 3: Combination therapy

Type of tumour	TZ	LSM1	LSM2	LSM3	LSM4	LSM5	TU marker
Ductal breast cancer	-100%	28	14	4	4	2	CA 15-3: -87%
Renal cell cancer	-89%	26	11	6	2	2	No marker
Non-small cell lung cancer	-78%	30	17	7	6	6	NSE : -74%
Prostatic cancer	-100%	22	8	2	2	1	PSA : -83%
Pancreatic cancer	-84%	30	28	7	7	5	CA 19-9: -56%
Endometrial cancer	-100%	18	4	2	2	0	CA 125: -49%
Cervical-uterine cancer	-100%	25	2	2	1	0	CEA : -71%

Table 1: Results of the application study. TZ: Change in the quantity of circulating tumour cells after 5 weeks. LSM 1-LSM 5: Score of the weekly laser scan microscopic findings. TU marker: Total change in the respective tumour marker after 5 weeks.

8.10 A pilot study in diabetics with intravenous laser blood irradiation using the insulin frequency of 3323 Hz

A. Wirz from Switzerland presented a pilot study with intravenous lasertherapy on 100 diabetics at the 3rd international congress of die European Society for Biological Laser Therapy and Acupuncture (EGLA) in 2008. Blood sugar levels were assessed before and after 200 applications of intravenous low level lasertherapy. The results were as follows: An average decrease of 1,54 mmol/lit in 70,5 %, an average increase of 0,82 mmol/lit in 28 %, whereas blood sugar remained unchanged in 1,5 %. Longterm sugar HbA1C was reduced by an average of 1,23%. Most efficient proved the red intravenous laser with the recently discovered insulin frequency of 3323 Hz. [57]. Of course these important data have to be confirmed in bigger studies, preferably multicentered and double blinded.



Combined laser therapy in diabetes mellitus

8.11 Intravenous laser therapy in horses

Preliminary results of a Multi-Center Pilot Study

A. Wirz-Ridolfi, M. Baumgartner, D. Burger, K. Gerber published a first study about intravenous laser therapy on horses in 2008 (58).

Intravenous blood laser therapy was performed on horses in Germany, France and Switzerland and its effect on the clinical course of diseases as well as on laboratory values was assessed.

As no such studies have been published so far it will be worthwhile to deepen this pilot study should be confirmed by further investigations with statistically significant numbers.

Between July 2007 and 2008 in total 14 horses were treated with intravenous laser therapy. 69 treatments were performed: 59 times with red (632nm), device weber needle blood from weber medical GmbH in Germany and 10 times with blue laser (405nm) with a prototype of the company EMRED in Helsinki.

Case reports:

Horse 1: One horse was suffering from a malignant melanoma with metastases. After 17 intravenous laser therapies no further tumour proliferation could be observed. The horse recovered from its energetic weakness and got the golden medal in distance riding 2007 and the championship of Switzerland 2007 over 138 kilometres. In laboratory haemoglobin increased from 126 g/l to 158 g/l (25,4%). The number of erythrocytes increased from 7,69 t/l to 9,7 t/l (16,4%).

Horse 2: A second horse with bronchial asthma lost these symptoms after eight treatments with the weber needle blood device.

Horse 3: Tertia is a 7 year old Paso Fino mare. This horse should be euthanized due to chronic lameness by chronic inflammation of hoof and fetlocks. Special orthopedic horseshoeing did not help, the horse could no longer be ridden and had pain when standing up and just lay still. After 8 times red laser IV with the weberneedle blood. The horse could be ridden again and lied down only for sleeping.

Horse 4: Lidador, a 13 year old Lusitano stallion suffered from chronic skin affection of unknown aetiology with a dull coat, dandruff and hair loss. All the local applications had no effects and the horse was irradiated intravenously 6 times with the IV laser weberneedle blood with red laser. This therapy led to a “restitutio ad integrum”, shiny coat, and - as a “side effect”: 2 first places in the German championship course riders.



Figure 2: Lidador in action (horse No.4)

Further 10 horses were treated at the Federal Stud in Avenches by Mireille Baumgartner et al. under the direction of Dr. Dominik Burger.

There was an increase in leucocytes of 8.33% and of neutrophils of 8.48% and the lymphocytes increased 14.6% respectively, which is in accordance with the various Russian studies on lymphocyte stimulation. In contrast, the eosinophils were reduced impressively by 52.21% and monocytes by 26%, possibly as an expression of the laser-related immunostimulation. The anti-allergic effect of the blood chemistry showed the following striking changes: a 22.9%-reduction of LDH from 552 to 426.2 U / litre (standard values from 140 to 440 U / l). CK-values declined in a similar manner of 22.4% from 349 to 270 U/l (standard values from 0-260 U / l). It can be concluded that the intravenous laser irradiation is leading to a detoxification of the body by activating the antioxidative enzyme system and improving kidney function.

The intravenous laser enables successful treatment of hard to treat diseases by improving physiological parameters. Especially oxygen capacity of the blood may be one of the most effective performance-enhancing effects.

9. Side effects and risks of intravenous laser blood irradiation

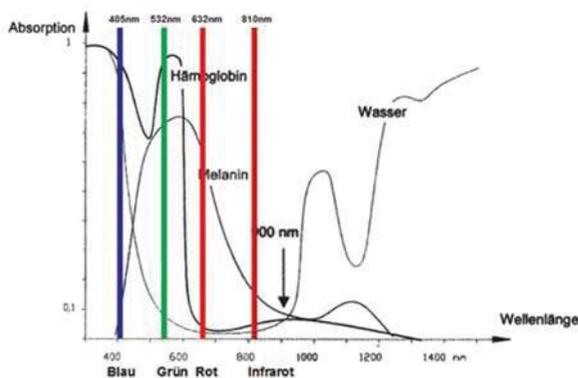
There was no report up to now about any serious side effects of intravenous laser blood irradiation. Considering the administered low power of 1-2 mW they are not to be expected. Laser acupuncture is a method, established over decades and virtually free of risk whereas also with this external therapy laser light is penetrating the body (with considerably higher power) and gets in contact with blood. The above mentioned ultraviolet irradiation of the blood has been established for many years whereas the potential danger with the administered short wavelength in theory must be rated considerably higher. In addition one can look back on a wealth of experience of about 30 years of use on a wide scale from Russia and other Eastern European countries where until today no serious side effects have been described too. Nevertheless a conforming enlightenment of the patient should take place with this method of treatment that is new in this country. The relevant legal aspects for the doctor responsible for the treatment were worked out by the lawyer Bodenbug extensively. In spite of an international CE-certification it is recommended to explain this new therapy thoroughly to the patient and if he agrees he should sign a document for informed consent. The juristic aspects are explained and discussed in the publication of Bodenbug [3].

10. Discussion:

The various positive effects of intravenous laser blood irradiation that are described in the literature could be affirmed to a large extent by the author and described pilot studies. But how the administered photon-energy reaches the particular organ-cells is not finally clear until today. Whether it is a matter of transfer of information of bio-photons or it concerns a transport of energy through other ways of metabolism with increased ATP-production at the end, needs an intensive scientific research in the next years. In former explanation models the transfer of electrons is responsible for the separate steps in energy transport of the cell. There are various electron carriers in the mitochondria like cytochrom-systems, flavins, Fe-S-complexes and others. One can measure typical absorption maxima for electromagnetic radiation for the various carrier-systems. At the absorption maximum the system can pick up the maximum electromagnetic energy and by that speed up the process of oxidative phosphorylation. For further research the calculated use of specific wavelengths that orientate towards the absorption maxima of the divers biochemical structures should be of fundamental importance. By this way stimulation or inhibition of enzymes of the metabolic pathways can

be investigated.

The new type of intravenous laser blood treatment presents a systemic form of (laser-) acupuncture. With the availability of an equivalent certified device we have now a new way of successful alternative therapy of clinical syndromes which can be treated with classical acupuncture only inadequately. These are especially diseases of the immune system and the liver as well as fat metabolism disorders and diabetes mellitus and their resulting complications as coronary heart disease and circulatory problems. The biological mechanisms are extremely complex and require further clinical researches and extensive basic studies. These researches could help to understand better the effects of photons in the organism.



Picture 14: Absorption diagram of laser light of different wavelength in biological tissues Source: modified from Romberg [41]

11. Conclusion:

The described connections and results of the intravascular laser irradiation method promise for the future an abundance of additional facts. It is interesting that here new ways open up in the treatment of common diseases. Especially diabetes mellitus, chronic hepatitis, cirrhotic liver and toxic liver diseases, cardiovascular diseases and autoimmune diseases including allergies must be emphasized. But the range of means of treatment should not be limited with that. The described immunological activation possibly opens also new therapeutical approaches in the adjuvant tumor therapy. Extensive studies will be essential in the future to explore the potential of means of treatment and find an answer to the fundamental questions of mechanism of effect.

The possibility of treatments with laser light of different wavelengths (red, green, infrared, blue and yellow) and the setting of various laser frequencies open more distinguished strategies of treatment and a new field of research that is not assessable.

Expression of thanks:

This project was financially supported by the ministry of economics of the government of Lower Saxony in Hannover and the European Union.

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Curriculum Vitae



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- 1950 Born in Hofgeismar, Germany
- 1968-1974 Studies of Chemistry and Biochemistry with Diploma at the University of Marburg in Germany
- 1974-1976 Highschool teacher in chemistry, biology and physics
- 1976-1983 Medical studies, University of Göttingen, Germany,
- 1983 Medical doctor
- 1983-1984 Research Max Planck Institute for Experimental Medicine in the field of gastrointestinal hormones, Göttingen, Germany
- 1984-1987 Assistant doctor University clinic of Göttingen, department of internal medicine
- Since 1988 Own medical clinic in Lauenförde/Germany for general and internal medicine
- 2000 Acupuncture A-and B-diploma
- 2001 Opening of a second medical centre for acupuncture and related techniques in Lauenförde/Germany
- 2006 Opening of a third medical centre for acupuncture and laser treatment and research at the Hospital Neu Mariahilf, University of Göttingen

- Authorized educator for general medicine, natural medicine and acupuncture by the government medical association in Hannover, Lower Saxony
- President of the European Society of Biological Laser Therapy and Acupuncture, Göttingen, Germany
- President of the American Association of Biological Laser Therapy and Acupuncture (AALA)
- Co-editor of the Journal “Pain and Acupuncture”
- Member of the Editorial Board of “Medical Acupuncture”, the official journal of the American Academy of Medical Acupuncture

Member of the following societies:

- European society of Biological Laser Therapy and Acupuncture (EGLA)
- American Association for Biological Laser Therapy and Acupuncture (AALA)
- European Medical Laser Association (EMLA)
- European Academy for Acupuncture and Auriculomedicine (DAAAM)
- German Medical Association for Acupuncture (DÄGfA)
- German Association for Acupuncture and Neuraltherapy (DGfAN)
- Austrian Society for Controlled Acupuncture (OGKA)

- American Academy of Medical Acupuncture USA (AAMA)
- Council for Acupuncture Research and Education USA (CARE)

Lectures:

- World Academy of Laser Applications (WALA)
- Annual lectures since 2002 on the congresses of the European Academy of Acupuncture and Auriculomedicine on spring and fall congress twice every year
- Annual congress of the Austrian Society for Controlled Acupuncture 2002, 2004, 2005
- Annual congress of the DÄGfA, Germany 2004
- Annual congress of the DGfAN, Germany 2004 and 2005
- World congress of orthopaedics 2004, University of Mainz, Germany
- Arab health congress Dubai 2005
- World congress in homeopathy and acupuncture, University of Khota Bahru, Malaysia 2003
- Annual congress of the American Academy of Medical Acupuncture, 2005, 2008 Washington, USA
- International congress for acupuncture, Yeddah Saudi Arabia, May 2007
- World congress of ICMART (International council of acupuncture and related techniques) in Edinburgh, UK, 2002, Washington 2005, Prague 2006, Barcelona 2007, Budapest 2008
- Meeting of CARE (Council for Acupuncture Research and Education), Charlottesville, Virginia, USA 2008
- World congress of the European Medical Laser Association (EMLA), Prague, Czech Republic 2007, Helsinki, Finland 2008
- International congress of traditional Chinese medicine in Graz, Austria 2004, 2005, 2006, Vienna 2007 and Graz 2008
- International congress of the European Society for Biological Laser Therapy and Acupuncture University of Göttingen, Germany 2006, 2007 and 2008
- International congress of the Iranian Heart Association in collaboration with the American College of Cardiology, Teheran, Iran, November 2008

Publications

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3. Weber M. Laserneedle for combined laserneedle electro acupuncture
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15. Weber M. The intravenous laser therapy, *German Journal for Acupuncture and related Techniques*, 10/2007
16. Co-author of the book: Laserneedle acupuncture, Pabst Science Publishers 2006 (in German, English and Korean)

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