



## **Low Level Laser Therapy & dermatology clinical research**

### **Dermatological–Aesthetics, Burns, Scars **LOW LEVEL LASER THERAPY IN DERMATOLOGY: AN OVERVIEW OF THERAPEUTIC POSSIBILITIES****

1Zlatko Simunovic, M.D., F.M.H., 2Tatjana Trobonjaca, M.D. 1Pain Clinic-Laser Center, Locarno, Switzerland 2Laser Center, Opatija, Croatia

The first application of Low Level Laser Therapy (LLLT) was completed on dermatological disorders like skin ulcers, in early sixties. In the meantime, dermatological indications for LLLT have increased. Particular effects of LLLT are observed when laser beam is applied on the open wound, which healing can be significantly accelerated especially in patients with delayed or impeded wound healing like patients with circulatory disorders, diabetic patients, etc. LLLT triggers biostimulative-regenerative processes inside the cell and subsequently causes revitalization of the issue as well. Second effect of LLLT refers to the vasodilatation and neovascularisation of local blood and lymph vessels, thus causing a better removal of waste products and, on the other hand, improved oxygenation and nutrition of damaged tissue. Analgesic and anti-inflammatory effects of LLLT are also significant when irradiating certain dermatological changes. All effects mentioned before will be discussed in details during the lecture. Therefore, LLLT is used today in dermatology in the treatment of the following conditions: - Ulcus cruris - Burns - Herpes infections - Scar tissue - Keloid - Sclerodermia - Rosacea - Neurodermitis - Eczema - Lichen ruber planus and scrofulosus - Psoriasis - Haemathoma - Etc. Each pathological condition will be explained, and optimal and individual energy densities will be presented in this lecture.

### **AESTHETIC TREATMENTS WITH LOW LEVEL LASER THERAPY**

1Tatjana Trobonjaca, M.D., 2Zlatko Simunovic, M.D., F.M.H. 1Laser Center, Opatija, Croatia 2Pain Clinic-Laser Center, Locarno, Switzerland

If taking into the consideration the list of aesthetic disorders which can be treated with either Low Level Laser Therapy (LLLT) or surgical lasers, it is justified to say that laser is also the light of beauty. Although its first applications were focussed on serious diseases like skin ulcers and painful conditions, employment of LLLT in aesthetics has initiated in mid seventies. Aesthetic changes are mainly benign and they won't seriously damage the health state of patient's body, but aesthetic problems are strictly subjective and the same problem causes different psychological reaction in different persons. Development in modern medicine and technology brought many new techniques and devices, which are successfully used in aesthetics today. Laser is one of the highlights in aesthetics today where it is applied mostly for facial rejuvenation, because the face is psychologically the most sensitive aesthetic area of each person. Facial rejuvenation

can be achieved with surgical lasers, which remove superficial layer of atrophic skin, leaving that area to be self-regenerated. It is an invasive method, while the process of regeneration can last few weeks even months, with a prohibition of exposing to the sunlight. On the other hand, skin rejuvenation can be completed with use of LLLT or athermal lasers like HeliumNeon (HeNe) or infrared (IR). The first one is mostly applied in the treatment of superficial changes, while the IR laser is used for irradiation of deeper structures. LLLT obtains good results in aesthetics due to its three main effects: biostimulative-regenerative, analgesic and anti-inflammatory effect, which will be presented in this lecture. LLLT can be applied in aesthetics like monotherapy or complementary treatment modality to the topical medications. Frequent indications for LLLT in aesthetics are as follows: - Acne - Cellulite - Striae - Alopecia - Wrinkles - Lentigo senile This lecture will cover all relevant details related to LLLT and each condition, with application techniques and recommended individual optimal energy densities.

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### **Soft Laser in Cosmetics**

Laser Partner, 11.3.2003

Marta Moidlova, M.D., Clinic for laser and esthetic dermatology and plastic surgery, Old Town Square, Prague, CZ

Premysl Fryda, MediCom a.s. Laser

E-mail: [moidlova@moidlova.cz](mailto:moidlova@moidlova.cz)

### **Abstract**

Cosmetics is a well established and independent branch, apparently different from plastic

surgery, esthetic dermatology and similar medical specialties, yet complementing them very effectively. However, is there any difference between individual beauty parlors? Definitely there is, but where? Enthusiasm, knowledge, experience, talents, good eyes and clever fingers - this is an absolute minimum in terms of a cosmetician's "software". Speaking about "hardware", a good cosmetician needs a suitable place for the business, a chair, a table, a mirror ... all the same. Then cosmetic milks, creams, masks, agents, all the beautiful jars, sprays and cups come ... they all have them, too. So where is the difference, if any at all? The difference lies in modern technical equipment, in technical devices helping a cosmetician be more efficient, more successful, more up-to-date, and, first of all, more attractive for the clients. And here, undoubtedly, laser dominates.

### **Technical gadgets**

Speaking about technical equipment, what options can a cosmetician have? Not many, really:

- Electrolytic epilator, though it is a bit an obsolete technique, a time consuming one, painful, unprecise, with imperfect results, and in case of electrocauter successive

scarring may appear.

- Vacuum lymphodrenage unit, though this technique comes much more under medical specialists, especially

as one of the means of consecutive treatment after oncological surgeries.

- Solarium - only a supplement from the point of view of cosmetics.

- Microdermabrasion seems an ideal option. It is capable of scraping off superficial layers of dead skin cells

from the face, décolté, hands etc. with a flow of tiny crystals. Microdermabrasion is a great tool in hands of

an experienced cosmetician, eliminating fine wrinkles, acne scarring, minor pigmented lesions, rough skin

and the like. The skin gets regenerated, smoothed and cleansed, not only the skin looks better, but is also

able to take in cosmetic preparations much better in the course of successive treatment.

- Polarized biolamps are also a possibility how to improve cosmetic treatments and care. However, we should

avoid using monochromatic devices using different color filters or sources, for those only deprive us of the

synergic effect of polychromatic light devices enabling the light to penetrate in different depths in tissue. A

separate article on the use of biolamps in cosmetics was published in Laser Partner Clinixperience No. 45/2002.

- Laser is the real king of cosmetics. Surgical laser is able to ablate wrinkles, repair scars, remove pigmented

lesions and age or sun spots, rid of unwanted tattoos and hairs. Some of the applications do not even have a

non-laser alternative, such as permanent hair removal or elimination of naevi flamei. All the above

mentioned applications, and many others, can only be performed with a surgical laser and by phisytians.

However, apart from those, there is another group of lasers, called soft lasers (a name very appropriate for

cosmetics), or therapeutic, biostimulation, low-level lasers (low-level laser therapy - LLLT), and those will

be the subject of this article.

### **Mechanisms of soft lasers**

Laser is nothing else but light with specific features, and it is generally known that for every living cell light is of fundamental and unsubstitutable importance. This

phenomenon can be noticeable best in plants assimilating light to be able to grow, however similar dependency applies to animal organisms, too. Lack of light causes

growth disorders and can also result in psychic defects, depressions, or even in a specific disease called seasonal light deficiency.

Laser energy is absorbed in tissue through cytochrome cells, mitochondrial apparatus of individual cells transforming light energy into cellular energy. At the same time,

passage of light improves permeability of cellular membranes, leading to their better nutrition, improved function and quicker cell division. These processes in tissue activate

macrophages (responsible for absorption of noxious agents and support of healing

processes), improve activity of fibroblasts (most cells supporting collagen synthesis in tissue), and support improved production of specific enzymes. Apart from stimulation of growth and wound healing medicine can also make use of other characteristics of laser beam, such as ability to decrease pain through influencing neural peripheries, anti-inflammatory effect, or stimulation of acupuncture points or physiological trigger points. In cosmetics it is very important to choose a suitable laser device. The first decision to make is an appropriate wavelength of emitted light, i.e. its color. The rule is that red color (632 - 670 nanometers - nm) is convenient for superficial applications, not penetrating deep in tissue and thus all energy being absorbed in the skin and subcutis. On the other hand, infrared (IR) lasers with higher penetration depths are quite useless in cosmetics, whilst they come in very useful in massage and physiotherapy facilities. The second important value is the power output of a laser, which should be for cosmetics within the range of 10 to 40 milliwatt (mW). Lower output leads to excessive prolongation of application times necessary to irradiate recommended dosages of energy, and, on the other hand, suitable red lasers with higher output are usually very expensive. The third important issue to decide on is the construction of lasing device. You can buy a laser with a hand-held pinpoint laser probe, which will be suitable especially when treating little lesions (See Fig 1). On the other hand, when working on larger areas (whole face, décolleté etc.), you might prefer a laser scanner automatically distributing light on required area and freeing your hands for another client (See Fig. 2). A laser with automatically adjusted parameters of therapy is recommended.

Figure 1: Treatment with a laser probe

Figure 2: Laser scanner

Soft laser in cosmetics

LLLT has many possible applications in cosmetics and laser can even lay the foundations

of a specialized beauty salon. The following list has originated on the basis of years of experience, and can provide readers with a general overview of potentials of this useful and profitable method.

1) Healing of inflammatory and other pathologies

- Acne - one of the most frequent cosmetic problems, due to civilization impacts shifting more and more into

middle age. Laser helps effective healing of papuli and pustuli even after a few applications, in most cases

skin responding to laser treatment spontaneously and very quickly.

- Alopecia – supportive treatment of alopecias, hair growth stimulation and improvement of quality.

- Dermatitis - LLLT helps to improve inflammatory and other conditions on the skin.

- Eczema - laser can improve quality of life of the patients by diminishing some of the superficial

manifestations of the disease.

- Herpes - one of the most effective applications. A herpes usually does not even appear if the painful spot is

irradiated before eruption, or has a relatively mild symptoms. In other cases a scab can be expected to create

on the herpes within a few hours after irradiation, avoiding unpleasant long lasting suppurative

manifestations. LLLT shortens healing by more than fifty per cent, and is also suitable to treat post-herpetic

neuralgia.

## 2) Post-procedure applications

- Healing of nail matrices - successful treatment also after nail design applications.
- Post cleansing treatment - quicker regeneration of skin suffering from red spots, minor edemas and

haematomas, open and widened pores.

- Post epilation treatment - application of LLLT after wax or electric epilation significantly soothes irritated

skin, healing up punctures in rather a short time. It is recommended to stimulate the area to be treated not

only after the application, but also before the initial hair removal, due to analgetic effect of laser light, as well

as due to more effective start up of healing processes.

- Permanent make-up - after mechanical penetration of pigments under the skin

LLLTL regenerates microscars, soothing irritated skin.

## 3) Scars management

- Post acne scarring - a long term treatment helps to improve the final condition.

- Scars - LLLT contributes to decolorization, smoothening and softening scars.

- Striae - regeneration of unwanted microscars and rhagadae in skin.

## 4) Improving the beauty of your clients

- Biostimulation of skin - overall soothing of the skin, improvement of its look, LLLT smoothenes and stretches

the skin removing its minor defects.

- Cellulitis - laser should be understood as one of the components of comprehensive treatment, LLLT

improving microcirculation of lymph and blood, locally decreasing the feeling of pressure and pain, releasing collagen threads.

- Dandruff - LLLT can help in combination with special anti-dandruff shampoos.

- Laser Mask (Le Masque de Laser) - application of a face mask, the performance of which is activated by

irradiation with a laser beam, a combination of deep cleansing of tissue with biostimulation.

- Rejuvenation - improving the looks, smoothening and tightening of the skin.

- Wrinkles - soft laser is not able to rid of the wrinkles mechanically, however by improving the condition of the skin it contributes to its increased flexibility and elasticity.

## 5) Other cosmetic-related applications

- Chronic Fatigue Syndrome - thanks to its stimulative effects LLLT may become a part of comprehensive treatment.

- Seasonal Light Deficiency (SLD) - application on epiphysis has been described as a means of suitable

psychostimulation.

- Migraine - relief of negative manifestations of similar diseases may sometimes also be required.

- Myorelaxation - beauty parlors are sometimes associated with massage or fitness facilities where LLLT can be used to decrease muscle spasms prior to initial massages, or to release tension in case of neck and lower back pain.

### **Hygienic conditions for soft laser in cosmetics**

It is generally believed that soft laser can be operated only by physicians, however this is not a correct opinion. Soft lasers can be commonly operating in, and their advantages can be made use of by, beauty parlors, haidressers salons, massage and regeneration facilities and the like, provided their users observing specific hygienic and safety regulations. The first prerequisite is a proper training, familiarizing the staff with performance and mechanism of laser in living organism, with possibilities of indications and applications, with initial laser techniques, as well as with contra-indications and labor safety. A laser workplace must be adapted in such a way that an unwanted laser beam cannot hit anybody, all windows and mirrors must be covered by jalousie or curtains not transmitting laser light during laser operation. Corresponding laser safety eyewear is also required. Every laser workplace is subject to hygienic control classification. Current medical legislation imposes a certain limitations on cosmeticians regardless to whether they work with laser or not. They must not break integrity of the skin, must not perform procedures on sick skin or mucosa, and must not manipulate scars and birthmarks. In fact most of beauty centers either co-laborate with doctors or work under direct supervision of medical specialists who can guarantee expert skin care in full extent. However, even within the frameworks of limited number of procedures, soft laser represents a reliable, effective, and attractive skin care.

### **Related articles**

- Laser Partner No. 23/2001: P. Petrovska: Laser in dermatology
- Laser Partner No. 25/2001: T. Trobonjaca, Zlatko Simunovic: Aesthetic treatments with low level laser therapy
- Laser Partner No. 33/2001: R. Smucler et al.: Laser Mask increasing the potential of laser biostimulation in cosmetology and dermatology
- Laser Partner No. 45/2002: Bozena Apetaurova: Biolamp in cosmetic practice

### **Literature**

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  - Zlatko Simunovic a kol.: Lasers in Medicine and Dentistry, Vitagraf Rijeka, 2000
  - Jan Tunér, Lars Hode: Laser Therapy - Clinical Practice and Scientific Background, Prima Books, Grangersberg 2002
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### **Case History of Laser Therapy of Extensive Burns and After-Burn Scars**

Laser Partner, 27.5.2002

Mr. and Mrs. Hintenaus, Dobrourov, CZ,

Mr. Pavel Malek, M. D., REHAB CENTRUM, Jihlava, CZ,

Mr. Jan Koupil, M. D., Clinic for Burns and Reconstructive Surgery, Faculty Hospital Brno, CZ,

Mr. Premysl Fryda, MediCom a.s. Laser, Prague, CZ

## **Abstract**

Unusual case history describing a long term treatment of extensive burns and after-burn scars with the use of LLLT on a baby patient.

The Parents

Their story started on 21st of September, 2000. Following mother`s two-months hospitalization, Claire was born before midnight. After three days, in the course of a routine check of the new-born baby, the hands of a nurse caught fire inside the incubator. The device was immediately in flames and so was its precious living contents. Fortunately, the resourceful nurse managed to take the baby out. However, despite of this, Claire sustained extensive burns on more than on one fourth of her body, and the fight for her life began. The doctor in charge as well as the entire medical staff managed to cool and treat the involved areas in the shortest possible time, including stabilization of vital functions. Claire had then been rushed to the Burns Center in Brno and handed over to the Intensive Care Unit of the Neonatal Department of Brno Faculty Hospital. "When they came at night to tell me that there had been a misfortune, my reaction reflected the condition after a complicated pregnancy and a childbirth. I was confused and the only thing that struck me at the moment was - why just me? However, we have never admitted that it could not turn out well," says Claire`s mother today. The incident of a burning incubator and a burnt baby girl had shocked both medical and general public. Numerous clinics using same devices all over the country have been waiting for the outcome of the investigation till now.

Investigation was complicated also by the fact that the course of the incident cannot be reconstructed... Presumably, the cause was a discharge of static electricity on the hands of the nurse. However, any speculation about the fault of the medical staff is rejected by Claire`s dad: "When you see your own child wrapped from head to toe in dressings, connected by various tubes to machines supporting basic vital functions during forced sleep, the only thing you can do is to beg her in spirit to fight for her life, not to surrender. The life is worth it. According to burns experts even five per cent is critical for such a baby. Claire survived five times larger extent than that! She was strong enough to fight for her life, and she won. Apart from all the efforts taken by the doctors and medical staff, it was also thanks to her strong constitution"

Though her parents did not surrender, too. The week following the accident they both spent in the hospital with their baby. Together they overcame the most critical period, hoping that everything will turn out well. After ten days doctors started to ablate damaged skin, transplanting gradually healthy skin from other parts of the body. After another week Claire was disconnected from devices and her mother came back to the hospital in order to be able to milk the baby and to learn how to treat healing wounds.

On 20th of October, less than a month after the incident, Claire was discharged from the hospital. At home, apart from common care for several weeks old suckling, the parents started massaging scars intensively several times a day, this care being usually accompanied by Claire`s loud disapproval. Waking up at five in the morning every day, massaging the baby and 20 kilometers by car to Jihlava for rehabilitation and laser therapy. Once a week also traveling 90 kilometers to Brno for check ups, expecting the results to come only after a longer time.

And how about the result? Scars after burns and transplantations are healing up successfully. Furthermore, regular laser irradiations and mechanical massages suited

Claire very well, and according to her parents Claire might even be smarter than other babies of her age. After two months Claire`s parents asked the doctor, who had been on duty at the newborns department that unfortunate night, to become Claire`s godmother. Action of the team under her leadership helped Claire to come back from the death`s door. "Even today, speaking about it makes me shiver down my spine," the doctor admits. Sometimes it is very hard to determine borderline between professional and private life. Definitely, the christening is a better thing to remember for her: "The girl is beautiful. I am happy it turned out well this way."

Picture 1: October 15, 2000, Condition before discharged from hospital  
Out-patients rehabilitation specialist

The patient was born on 21st September, 2000, when pregnancy was terminated in the 36th week of pregnancy by a Caesarian section. Before delivery mother had been hospitalized due to cervicouterine insufficiency. The patient is born immature - 2850 grs.

/ 47 cms. - thus embedded in an incubator due to breath complications, transitoral hypoglycaemia, and newborns jaundice. On September 25th, at 00.50 the incubator ignited causing II - IV grade burns of the baby in the extent of about 20 per cent. Following sterile cover and overall therapy (sedation and infusion) the patient was moved in an ambulance to a specialized burns center. Patient`s finding described multiple combustiones II grade on 2 per cent of the body (healed up conservatively) and III - IV grade burns on 18 per cent of the surface of the body, where there was in two phases performed chemical necrectomy with subsequent autotransplantation with a mediumthick D-E graft in 1:1.5 ratio. Implants adhered in full extent, transplant source areas healed up well, too. Mother was trained in nursing care and they both were discharged on the 26th day for home care (weight 3310 grs.). The patient was taken over in dispensary of out-patients children`s burns department.

Henceforth pressure massages were carried on 3 times a day at home (30 minutes back, 30 minutes hand - by turns with application of Contratubex or Hiruroid ointments), together with laser therapy (LLLT) with a superficial scanner 670nm/25mW, dosage 2.6 J/cm<sup>2</sup> for 20 minutes on the most affected areas, i.e. an area of about 12.5 x 4 centimeters on the back and the left upper limb. LLLT daily for 6 months. Apart from that, irradiation with an IR laser probe 830nm/30mW, dose of 3 J/cm<sup>2</sup>, applied on several localities (especially on a spot on the left elbow, the left thigh, the left wrist, and fingers 3, 4, and 5 on the left hand).

A

According to finding of November 15, 2000, scarry surfaces inflexible, slightly over the level, hyperaemic, deformities on the left little finger. Finding of November 29 - hypertrophic cicatrices on the trunk and left forearm gradually maturing, the course seems favourable. Only the condition of the area of left wrist and left little finger unfavourable due to gradual luxations of metacarpophalangeal and distal interphalangeal joints caused by contracting hyperfrophic scars. According to our finding the main progress can be noticed on the back where especially the peripheral parts significantly improved. Minimum effect noticed on the most affected fingers of the left hand, especially the little finger. From January 9, 2001, laser Maestro with an infrared LineScan scanner 830nm/200mW was lent to carry on with LLLT at home. Therapy performed for 20 minutes on the back, dosage 2 J/cm<sup>2</sup>, output power decreased to 100 mW, identical dosage on the left hand, time 13 minutes and 20

seconds. Furthermore, a supplementary dosage on the most affected fingers of the left hand (area 3 cm<sup>2</sup>, dosage 3 J/cm<sup>2</sup>, output 200 mW, time 1 minute and 30 seconds). In addition to that, superficial irradiation with a pinpoint laser probe 670nm/10mW, dosage 2 J/cm<sup>2</sup>. This therapy performed daily including weekends till February 14, 2001, other therapies, i.e. press massages and ointments, unchanged. Finding of a specialized clinic as of January 10, 2001, mentioned improved condition, scarry areas gradually softening, contraction of left little finger remaining. Finding of February 7, 2001, identical, hypertrophic scars on lateral side of the left forearm slightly less hyperaemic. Finding on the little finger the same. From February 15, 2001, LLLT substituted by phototherapy with Biolamp, irradiation 3 times a day for 20 minutes.

After 4 weeks LLLT introduced again for the period of 2 months, IR laser probe 830nm/40mW, dosage 3 J/cm<sup>2</sup> every day, pinpoint irradiation of the forearm on 2 spots, 10 points on the wrist and fingers, 6 points of irradiation on the back. Overall evaluation of efficacy on November 22, 2001, i.e. after roughly 14 months, statesignificant improvement of the condition, especially on the back. There is an area of about 2 x 6 centimeters remaining inflexible and latticed after above mentioned plastic surgery, presumably with the prospect of a rather extensive excision being necessary in this terrain. Furthermore, a significant improvement especially on the left forearm, left thigh and on dorsal side of the wrist. Unfavourable situation is remaining in the area of the left little finger, but there has probably been a severe trophic defect after a IV. grade burn, hitting deep structures including bones and not yet fully developed joints. Gradually a severe contracture of little finger developed, and thus it had to be resolved by an amputation on April 4, 2002. On the basis of above mentioned findings it is possible to imply quite clearly that the most significant improvement had taken place during the first two months of application of LLLT. The condition was improving further on, but not so distinctly as at the beginning. In general, it is possible to regard LLLT highly successful, but the importance of its early introduction should be stressed once more.

Picture 2: The scars after a series of laser irradiation - 4 months after injury  
Specialized burns clinic A rare clinical case. A new-born baby girl suffered 72 hours after the birth (Section Caesarea) a thermal injury when an incubator caught fire due to not yet revealed circumstances. Total area of burnt skin was 18 per cent III. grade burns and 2 per cent II. grade burns. The newborn had been treated by a team of experts of the Faculty Hospital Brno (a neonatologist, an anaesthesiologist, a plastic surgeon, a physiotherapist) in the Newborn Department of the II. Children`s Clinic. With regard to the extent and depth of the burns the newborn was artificially ventilated. The patient was resuscitated with crystalloid as well as by colloid suspensions, continuous antalgic sedative care, heparinization, substitution of antitrombine III, enteral and parenteral nutrition, immunity support by gamaglobulines and targeted medication by antibiotics according to results of microbiologic findings. Having stabilized the condition from the sixth day on, the team started a phased chemical necrectomy of the burnt areas as well as covering of the defects with artificial teguments. On the twelfth day after the injury we carried out autotransplantation with a thin dermoepidermal implant, ablated from both the thighs, right gluteus, and from the back. In the course of hospitalization no serious complications had occurred, and 24 days after the injury with the burnt areas having been healed up the child was discharged for home care. From day 32 application of LLLT started. The patient was visiting our clinic for regular

check ups when her condition was evaluated with special regard to prevention against hypertrophic scars formation. Adequate therapy and rehabilitation exercise had been recommended. The first series of LLLT was completed 4 months after the injury. After following series of LLLT skin hyperpigmentation gradually discolored. The color of the skin was getting close to standard color, and the scars were flattening. Despite all efforts (combination of biostimulation and biophysical rehabilitation techniques) we still were not able to influence substantially deformities and contractures of scars on ulnar side of the little finger. Thanks to excellent results in scar management in patients after a thermal trauma LLLT has become a common part of prevention against hypertrophic scars. It also helps to heal up chronic wounds. This therapy has best results when applied on firm palpable scars, red in color and profusely vascularized. Excellent clinical results have been corroborating a positive effect of therapeutic laser on hypertrophic after-burn scars.

Picture 3: Condition 1 year after the injury  
Laser manufacturer

From time to time you may happen to read in your newspapers an article hitting you much more than all the others do. However, with a little bit of sarcasm you can say that newspapers are all shocking news today, but anyway, something really can knock you back, that`s the way it is. And this was just the case of a burning premature baby girl in an incubator. In an incubator which should originally have kept the baby alive, but despite of this, oxygen flowing into the device on and on kept the baby burning.

Therapeutic laser means a significant support for a weakened organism, especially in terms of speeding up wounds healing, local diminishment of pain, and general biostimulation of body structures. In this particular case laser could stimulate healing of wound areas after autotransplantation, speed up integration of transplants, and especially help in post-operative rehabilitation of scars in order to soften and discolor them. Furthermore, there was a real risk of formation of keloid scars which would possibly block mobility or cause other problems in the future.

Soon we had found out that the burns clinic had had a laser available, and also the rehabilitation centre, which took over post operative care of the girl, was equipped with a laser scanner. Should this not be the case, we were ready to offer a long-term loan of a laser, just like we had done it in the past, for example in the case of a little schoolboy who had been poured over with an inflammable liquid and burnt by his schoolfellows, suffering burns on his hand and neck, or a woman who had been bitten in the face by a dog, or an ice hockey player who had had his cheek cut by a rival player`s skate blade, and so like. However, we could not help in this case, so we only gave an occasional call to the doctor, just to ask how therapy proceeds. About a month later we were contacted by the father of the girl. It was early December, wintertime. He tried to explain that they were living in the Highlands, having to go by car every day more than 20 kilometers (on a road which sometimes gets negotiable by car very hard, as it happens from time to time during the winter in the countryside ...) to the town for laser therapy. This meant waking up at 5 o`clock in the morning every day, then to carry on with massages of the baby, see their two other children off to school, and then go by car for laser therapy, regardless to how the weather looks like. He asked us whether we could lend them a laser to proceed in the therapy at home. However, this was what we could not do, since working with a laser is subject to strict hygienic and security rules and, furthermore, the legislation does not allow us to distribute high-performance professional lasers to uninitiated public. At the end there

was a possibility how to manage the situation thanks to human sympathy and understanding. The parents attended a laser medical training course, district hygienist officer inspected the house approving a "laser workplace" in one of the bedrooms, setting up binding rules for operating the laser. A laser scanner was installed, the parents being trained in how to operate the device. The parents closely cooperated with the doctor. This temporary and quite extraordinary solution could contribute to a quicker rehabilitation of the little patient, helping the whole family to overcome a dramatic episode. Good luck, Claire!

Skin Therapy Lett. 2003 Apr-May;8(4):4-7.

**Nonablative laser and light therapy: an approach to patient and device selection.**

**Alam M, Dover JS.**

Section of Cutaneous and Aesthetic Surgery, Department of Dermatology, Northwestern University, Chicago, IL, USA.

Nonablative laser and light therapy is a relatively novel modality for the improvement of the visual appearance of photodamaged, scarred, and injured skin. A number of different

wavelengths and devices have been purported to be efficacious for the delivery of nonablative therapy. Among the features that can be addressed are red spots and telangiectasia, pigmentation and lentigenes, and their daily routines while benefiting from

the cumulative effects of skin rejuvenation.

**The effects of adding low energy laser irradiation after skin resurfacing in lowering complication. Laser Surg Med. Abstract issue, 2002, abstract 242.**

Fereydsen E, Samieh M.

Laser therapy is a valuable supportive therapy after skin resurfacing with CO<sub>2</sub> laser. In a study by Fereydsen. twenty patients had full face skin resurfacing with superpulse CO<sub>2</sub> laser, 500 mJ/cm<sup>2</sup>. Ten patients had additional 780 nm laser therapy. This additional therapy lowered complications such as pain, erythema, infection rate and itching. Plast Reconstr Surg. 2002 Sep 1;110(3):912-22; discussion 923-5.

**Fat liquefaction: effect of low-level laser energy on adipose tissue.**

**Neira R, Arroyave J, Ramirez H, Ortiz CL, Solarte E, Sequeda F, Gutierrez MI.**

Department of Plastic Surgery, Centro Medico Imbanaco, Avenida 4-Oeste #5-274, Apto 301 B, Edificia Bosque Valladares, Cali, Colombia. neira-rod@emcali.net.co

Low-level laser energy has been increasingly used in the treatment of a broad range of conditions and has improved wound healing, reduced edema, and relieved pain of various etiologies. This study examined whether 635-nm low-level lasers had an effect on adipose tissue in vivo and the procedural implementation of lipoplasty/liposuction techniques. The experiment investigated the effect of 635-nm, 10-mW diode laser radiation with exclusive energy dispersing optics. Total energy values of 1.2 J/cm<sup>2</sup>, 2.4 J/cm<sup>2</sup>, and 3.6 J/cm<sup>2</sup> were applied on human adipose tissue taken from lipectomy samples of 12 healthy women. The tissue samples were irradiated for 0, 2, 4, and 6 minutes with and without tumescent solution and were studied using the protocols of transmission electron microscopy and scanning electron microscopy. Nonirradiated tissue samples were taken for reference. More than 180 images were recorded and professionally evaluated. All microscopic results showed that without laser

exposure the normal adipose tissue appeared as a grape-shaped node. After 4 minutes of laser exposure, 80 percent of the fat was released from the adipose cells; at 6 minutes of laser exposure, 99 percent of the fat was released from the adipocyte. The released fat was collected in the interstitial space. Transmission electron microscopic images of the adipose tissue taken at x60,000 showed a transitory pore and complete deflation of the adipocytes. The low-level laser energy affected the adipose cell by causing a transitory pore in the cell membrane to open, which permitted the fat content to go from inside to outside the cell. The cells in the interstitial space and the capillaries remained intact. Low-level laser-assisted lipoplasty has a significant impact on the procedural implementation of lipoplasty techniques.  
Semin Cutan Med Surg. 2002 Dec;21(4):280-7.

**Intense pulsed-light photorejuvenation.**  
**Sadick NS, Weiss R.**

Department of Dermatology, Weill Medical College of Cornell University, New York, NY, USA. nssderm@sadickdermatology.com

Intense pulsed light photorejuvenation represents a novel mode of treatment of photodamaged skin. A broad-spectrum flashlamp (500-1200 nm) targets chromophores reversing pigmentation, vascular and pilosebaceous aberrations. Both cytokine mediated as well as thermally induced deep dermal remodeling may be achieved using the varied polychromatic wavelengths associated with this technology. Inflammatory dermatosis such as rosacea may also be addressed as well. A structural approach to non-ablative rejuvenation utilizing intense pulsed light is associated with high patient satisfaction and minimal adverse sequelae.  
Semin Cutan Med Surg. 2002 Dec;21(4):251-65.

**Biophysics of nonablative dermal remodeling.**  
**Ross EV, Zelickson BD.**

Dermatology Department, Naval Medical Center San Diego, San Diego, CA 92134, USA. vicross@mfnc.com

This article explores the physics of nonablative skin remodeling as well as the histologic sequelae. Although there have been several studies of nonablative skin remodeling, the exact mechanisms of action and thus the optimum device-specific parameters are not yet known. The article is divided into a discussion of the physics of laser-tissue interactions, followed by a review of the types of devices used for nonablative skin remodeling, and the histologic findings that follow treatment.  
Hautarzt. 2002 Jun;53(6):385-92.

**["Skin rejuvenation" by non-ablative laser and light systems. Literature research and overview]**

[Article in German]

**Grema H, Raulin C, Greve B.**

Laserklinik Karlsruhe, Kaiserstrasse 104, 76133 Karlsruhe.

Currently, ablative laser therapy (with CO<sub>2</sub>/Er:YAG lasers) and deep chemical peeling are effective and promising methods of skin rejuvenation. The induction of collagen synthesis was observed after peelings with trichloroacetic acid or phenol as well as after treatments with the CO<sub>2</sub> laser. In past years, the undesirable side effects and risks of

these methods have led to intensified research in the fields of non-ablative facial rejuvenation and subsurfacing by means of ablative laser systems and intense pulsed light systems. The objective is to achieve selective, heat-induced denaturalisation of dermal collagen that leads to subsequent reactive synthesis but does not damage the epidermis. Recently, the results of numerous clinical and histological studies have indicated that these new technologies are successful. After critical review and assessment of current literature, we can say that in terms of their efficacy, non-ablative methods are not a comparable alternative to ablative skin resurfacing. Used by permission of the Czech Society for the Use of Laser in Medicine, [www.laserpartner.org](http://www.laserpartner.org)

### **Biolamp in Cosmetic Practice**

Laser Partner, 3.4.2002

Bozena Apetaurova, M. D., Ph. D.

#### **Abstract**

The paper of now deceased author deals with the use of polarized Biolamp in everyday cosmetic practice. It stems from theoretical bases of effects of polarized light on various wavelengths on the skin and describes its general influence on metabolism and microcirculation in the tissue. Biolamp is an effective tool in treating acne, seborrheic eczema, alopecias, herpes, wounds, ulcers, and in regenerating aging skin. Although all these complaints are primarily indicated for a therapeutic laser (LLLT), especially in extensive and serious cases, Biolamp has proven itself a successful complement of LLLT, or in minor cases even a simpler and inexpensive alternative of LLLT.

#### **The Effects of Light**

Cosmetics is a branch encompassing both prevention and therapy of skin diseases. It consists of skin cleansing, massages, the use of cosmetic agents and preparations and, last but not least, phototherapy with Biolamp as one of its forms.

Sun rays touching the Earth include in its spectrum parts with wavelengths roughly between 300 to 4000 nanometres (nm). The band of visible light reaches from circa 430 to 750 nm. Shorter wavelengths mean ultraviolet light, whilst infrared (IR) light is emitted on longer wavelengths. Human body is used to these wavelengths.

Human organism in general, and human skin in particular react to irradiation within these wavelengths in different ways, often very selectively in rather a narrow frequency band, and this has been utilized in applications of therapeutic as well as of surgical lasers in cosmetics. In general we can say that the skin is relatively pervious for light irradiation between 300 and 1100 nm, thus this irradiation can penetrate the skin rather deep. Longer bands of IR irradiation with wavelengths longer than 1300 nm are absorbed well in the skin, this becoming evident in increasing the temperature of the skin. Under excessive exposures ultraviolet light has generally mutagenic and cancerogenic effects and it is necessary to consider it harmful. Irradiation in the shorter IR band of the spectrum within 750 - 1100 nm wavelengths is the main resource of energy for plants and some types of bacteria in the nature and, according to literature (1) it may also be a source of energy for cells of human organism. Positive effects of light irradiation on treatment and healing of skin has been known for a long time. However, the knowledge of effects of its individual spectral parts and of its characteristics (polarization, for instance) has deepened only in the course of the last few decades, so that it might be possible to make the best of it for rational treatment, especially when modern technical means, such as Biolamp or a therapeutic laser, are so easily accessible. Biolamp emits light in spectral range 430 - 2800 nm. Its light does not

contain any ultraviolet, nor significant heat infrared parts. Light within the range of 750 to 1200 nm, i.e. in the range where human body cells are able to transform the energy of light radiation into cellular energy, is the most intensive. This, as well as other, not so very well known, effects of light irradiation have a positive effect on the skin. In general, it is possible to state that thanks to this particular light energy cellular metabolism is improved and oxidation processes in cells intensified, both resulting in possible regeneration of damaged cells as well as in strengthening of healthy cells. Through improved oxidation of the tissue its resistance to infections is strengthened. Furthermore, division of fibroblasts, of which ligamentary cells differentiate, is influenced positively as well as metabolism of collagen filaments is improved, as far as their production in the event of deficiency is concerned. Blood microcirculation, favouring quick resorption of oedemas in damaged tissues, is positively influenced, too. Biolamp emits polarized light. Polarization is believed to improve mentioned positive effects, although photobiological basis of this mechanism has not yet been fully revealed. Biolamp irradiation has generally biostimulative, anti-inflammatory, and regeneration effects on skin, and these can be advantageously utilized for a complimentary treatment in a cosmetic practice.

### **Treatment of Acne with Biolamp**

One of the most frequent dermatoses is represented by acne. It affects cheeks, forehead, shoulders, back and chest. Unsightly look of the skin causes patients depressions, bringing often also psychic problems. It has been till today a grave therapeutic problem for cosmeticians as well as for physicians.

Acne is a chronic inflammatory affection, damaging a pilosebaceous unit multifactorially. Hyperkeratinization and obstructions of sebaceous follicles appear. Increased level of androgenes stimulates increase of production of sebum and multiplication of bacterial flora, particularly of Propionibacterium Acnes, causing successive inflammatory manifestations. Primarily, clinical image of acne includes comedones. Furthermore, there appear papulae, papulocysts, cysts, apostemas, conglobates, and indurations. Acne is classified according to the scope of affection. For cosmetic purposes it is usually suitable to distinguish between primary acne without inflammatory symptoms, and secondary acne accompanied by inflammatory manifestations, or between superficial and deep acne. Strategy of treatment and prognosis of the disease is determined according to the scope of involvement. There is a rule to begin the treatment as soon as possible, even though extent and clinical symptoms may appear only minor, for further complications and progression of the ailment can only hardly be foreseen.

Therapy should be approached comprehensively, and we should make full use of all diagnostic resources in order to be able to determine individually the best suitable treatment. Therapy requires good cooperation between therapist and patient, strictly observing dietary and hygienic regimes, as well as regular and thorough treating and cleansing of the skin at home. Rational treatment is aimed at the overwhelming phenomenon. In fact it means to be concentrated on decrease of formation of comedones, suppression of creation of sebum, positive influence on bacterial flora, and quicker healing. Therapy can be either fully external, or externally-internal utilizing antibiotics, hormonal therapy, corticosteroids, retinoids etc. (3, 4, 5)

For a cosmetic care treatment of only superficial forms of acne with no major purulent affections is appropriate. In case of even minor inflammatory finding consulting a physician-specialist is recommended.

Regular mechanical cleansing of affected spots on the skin holds a significant role in treatment of acne. Expertly thorough and gentle cleansing is the basic prerequisite of successful healing of acne (Editor: incl. among others deep cleansing of skin using the Laser Mask - see Laser Partner Clinixperience No. 33).

Agents utilized in cosmetic practice represent a broad and rich spectrum, however these are not subject matter of this paper. High hygienic care, as well as due choice of these agents should be paid attention to. We recommend using natural agents with no irritating conservatives and perfumes.

Treating deeper forms acne we shall change the strategy complementing standard external treatment by internal medication, based on long-term administration of antibiotics, hormonal preparations, corticoids etc. Regular monitoring of both clinical and laboratory values is necessary in these cases, due to possible side effects of these drugs on the organism. The main effort in treatment of acne is always to use all possible non-invasive means to treat affected skin and to keep the skin in a good condition. One of these means is phototherapy and therefore I am now going to describe my good experience in using Biolamp. In the course of twelve months I was treating total 47 patients with problematic acne affected skin, 39 women and 8 men. The youngest member of the group was a girl at the age of 13 years, the eldest was a 47 years old woman. Average age of the group was 26.6 years.

In all the cases I was proceeding in the same method, consisting of cleansing of the skin a using special foments and masks. Furthermore, a strict regimen and skin care products were recommended for home care. Cosmetic agents were pure natural, and were not changed for the whole period of following the patients. Biolamp was applied as a complementary means of treatment. At the beginning of treatment of mentioned patients Biolamp was used as often as possible. It was applied on duly cleansed skin for the period of 5 minutes, at least 10 to 15 times, for 3 to 5 weeks. Following applications were changed according to results obtained. I consider this number of applications significant, for noticeable improvement

occured after 3 to 5 irradiations at the earliest. Interruption for a longer time lead to relapses. This gusty start has appeared necessary to obtain a good therapeutic effect.

Best results were achieved when a patient having purchased a Biolamp applied it at home for about 3 minutes 3 times a day. In all the cases after such a therapy a great improvement was noticed, followed even by a complete heal-up in cases of a minor inflammatory finding. Tactics of further time applications of Biolamp was directed by local findings. I usually applied Biolamp in once-a-week to once-a-month periods, for the whole time of further monitoring. Majority of patients had noticed themselves aggravation of acne manifestations in certain periods (before menstruation, after viroses, after taking certain drugs etc.) and therefore made preventive visits during these risky periods in order to take more frequent

irradiations with Biolamp in order to avoid, or even totally supress such a deterioration.

### **Other Cosmetic Applications of Biolamp**

During a systematic one-year following of effects of Biolamp on acne-affected impure skin there was also a possibility to monitor its effects on other skin affections, simultaneously occuring in the patients. I am going to mention those with a noticeable positive effect of Biolamp irradiation.

So called seborrhoic eczema appears usually on the forehead at the borderline between skin and hairy part of head, being manifested by exfoliating itchy skin. However, it often

affects the whole scalp. Exfoliation is sometimes markedly suggestive of dandruff. Greasy hair and its excessive defluvium are rather a rule. After application of Bioplamp on the face with the light spot reaching up over the forehead the condition improved remarkably. That was why I extended in these patients irradiation with Bioplamp to the hairy scalp, too. However, positive effects were obtained also against excessive hair loss after illnesses, stress, drugs medication (especially antibiotics) etc.

On atopic eczema application of Bioplamp was also a benefit upon standard dermatology treatment, according to professor Novotný's statement. (2)

After a long term application of Bioplamp I noticed significant regeneration changes, especially on older skin. Skin became smoother with wrinkles less noticeable, with a nice healthy look. I also achieved minor scars after secondary healing of acne getting smoothed away on different levels. I use Bioplamp as a part of a complex cosmetologic care of aging skin. Furthermore, very good results on herpes labialis were recorded. Application of Bioplamp for about 5 - 6 minutes twice a day in the very initial stage of the disease caused almost immediate halt of further progression. Herpes dried quickly without recement. I also have to mention good results in healing fresh wounds and on early phlogistic processes on the skin, as well as on varicose ulcers.

### **Conclusion**

It is necessary to stress that Bioplamp is no panacea. Bioplamp should be regarded as an effective supportive treatment complementing standard methods and comprehensive skin care, if applied in suitable frequency and reasonable dosages. However, it should be mentioned that its effect appears after a longer application and thus an immediate success cannot be expected. In the course of my monitoring I could not use a control group due to obvious reasons, for each patient has the right for all accessible means to be used on him/her in order for the best possible results be achieved in the shortest possible time. Therefore evaluation of results must obviously be subjective, being based not only on my findings, but also on reactions of my patients. The evaluation is unambiguously positive. In cases of larger and substantial afflictions, deep scars and other diseases of the skin obviously treatment with a laser (LLLT) is recommended. Complementary and simple irradiation with Bioplamp also proved successful, since results obtained by laser therapy can be stimulated and confirmed with no further progression of the disease. Last but not least, using Bioplamp is very simple, safe, and not requiring special precautions, meaning a great advantage not only for a cosmetic practice but also for its home use.

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Qlaser Wellness Solutions  
Michael F. Lagana, President  
708 Route 35 N., Neptune, NJ 07753  
732 866-4226  
Michael@Qlaserws.com