Aesthetic Treatments with Low Level Laser Therapy

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ABSTRACT

The aesthetic changes are mainly benign and they will not seriously damage the health state of patient's body. But if observing a patient through the harmony between body and soul, it is clear that changes in aesthetic aspect of a patient create an unhappy person. Aesthetic issues are strictly subjective and the same problem causes different psychological reaction in different persons. The employment of laser in aesthetics has initiated in the mid seventies Nowadays it is widely used either as high power or surgical or low power or therapeutic laser for the purpose of improving aesthetic aspect of both males and females, with its application rapidly broadened world-wide.

INTRODUCTION

The development in modern medicine and technology brought many new techniques and devices, which are successfully used in the aesthetics today. The laser is one of the highlights in aesthetics. It is applied mostly for facial rejuvenation, because the face is the most sensitive aesthetic area of each person. Facial rejuvenation can be achieved with laser skin resurfacing, completed with use of surgical or thermal lasers, which remove superficial layer of atrophic skin leaving that area to be regenerated by itself. It is an invasive method, while the regeneration process can last even few weeks or months, with a prohibition of disposing to the sunlight. On the other hand, skin rejuvenation can be completed with use of LLLT or thermal lasers like Helium Neon (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 the aesthetics due to its three main effects (biostimulative – regenerative, anti-inflammatory and analgesic effect) [1]. But, multiple lasers allow the treatment of most contrasting aesthetic indications.
LLLT can be applied as monotherapy or as a complementary treatment modality. When applied on dark or white skin persons, energy densities should be increased or decreased, respectively, due to the partial absorption of laser light in the melanin. Therefore, skin type Fitzpatrick I-II[2] should receive at maximum 50% less energy, while the skin type Fitzpatrick VI[2] requires maximum of 50% more than the doses outlined further in this chapter.

Introduction to LLLT

- The skin has to be cleaned with alcohol or ether, in order to remove fat and existing microorganisms from the surface area.
- If necessary, skin has to be shaved, because hair reflects the laser beam, reducing its initial power and the capacity of penetration.
- When used as a complementary procedure, LLLT is usually combined with topic medications. In this case LLLT should be combined with water-soluble substances, and never with fatty substances like creams or ointments, which block the penetration of laser beam into the skin. Fatty substances can be applied after laser treatment.

Contraindications for employment of LLLT are the following:

- malignant tumors located on irradiated area (basalioma, melanoma, etc.),
- epilepsy, (the ray of light can cause an epileptic seizure),
- endocrine glands,
- irradiation of abdomen during the pregnancy,
- light hypersensitivity.

There is no contraindication in terms of exposure to the sunlight after LLLT within usual physiological limitations and protection with the corresponding sunlight protection factors.

Safety measures have to be carried out, where the first measure is wearing of protective goggles. Since non-contact scanning technique is widely used in the aesthetics, it is recommended to avoid metal furniture, which enables the reflection of light.

INDICATIONS

The followings are common indications for employment of LLLT in aesthetics:

- Acne
- Scar
- Wrinkles
- Cellulite
- Striae
- Lentigo senile
- Alopecia (baldness)

ACNE

There are numerous factors, which can lead to the formation of acne, as well as numerous theories that explain their causes. It seems that the seborrhea is the basic condition for its development. Further the influx of androgen hormones occurs, causing the increase of the size and the activity of sebaceous glands. Those glands can be genetically predetermined to be sensitive on different stimuli triggered by various infectious foci inside the body, psychological tensions, stress, hormone misbalance especially in the teenage period of life, etc. As a result, there is an intense comedo formation.
When the glands are already changed and the production of sebum has been increased, *Corynebacterium acnes* located in the follicles increase their lipolithic activity and disintegrate triglycerid from the sebum into the free fatty acids. Those acids irritate the follicle and cause its inflammation, rupture and peri-follicular spread of inflammation.
There are several types of acne: comedonica, papulopustulosa, indurata, abscedens and conglobata.
Acne is usually located on the face, back and upper levels of the thorax region (décolleté).
Acne comedonica are developing after the aperture of the follicle has been narrowing, so the sebum remains within the follicle. Comedo can be black- and whitehead.
Blackhead comedo or *comedo apertus* is usually open to the surface area and contains the solid sebum. It can be easily emptied without causing a damage to the follicle itself, revealing gray contents.
Whitehead or *comedo occlusus* develops when the follicle is narrow, closed and filled with white substance.
Clinical features reveal papule; red and painful skin nodule, which can develop around the comedo. In more progressive stages, comedo can cause inflammation and pustules changes, due to the influx of bacteria. Inflamed tissue is painful, itchy, and red. They usually heal with the formation of scar tissue and long–term changes in the trophy of the skin. Aesthetic importance is significant, especially due to the specific age of majority of patients (teenagers and young adults).

LLLT Procedure

As an introduction to LLLT, area affected with acne should be cleaned with a classic cosmetic procedure, paying attention to aseptically conditions.

If the inflammation is not caused by the bacteria, acne can be treated with HeNe or combination of HeNe and IR laser irradiation as monotherapy.

When inflammation is caused by bacteria, LLLT should be combined with the topic application of water-soluble antibiotics. They have to be applied after LLLT, which causes improved microcirculation and local metabolism, thus causing better effectiveness of an antibiotic.

Recommended doses are 3-6 J/cm^2 depending on the depth of the inflammatory process.

LLLT should be applied in a non-contact technique, using manual or automatic scanning.

CELLULITE

The cellulite is an angiopathy caused by a damage in the capillary and venous system of blood and lymph circulation. That damage occurs in the subcutaneous tissue and leads to an abnormal fibroblast and reticule-endothelial response in the affected area, causing increased deposition of fat in the adipocit cells. The disturbance in the capillary system inhibits fat release and the lymph circulation, thus causing changes in the trophy of the affected tissue. The connective tissue reacts through the formation of micro and macro nodules, which further impede the lymph circulation, causing interstitial fibrosis in form of a network. External manifestation of those changes is known as cellulite ("orange peel")[3].
Aetiology
Aetiology of cellulite reveals numerous factors, which can eventually lead to its formation:

- Genetic and constitutional predisposition,
- Endocrine disorders (e.g., female sex hormones, hormone contraceptive pills depending on the levels of estrogen),
- Metabolic disorders,
- Age (puberty and menopause),
- Venous and lymph circulatory disturbances,
- Unbalanced eating habits,
- Sedentary life style,
- Pregnancy,
- Liver diseases,
- Gastrointestinal system disorders (obstruction),
- Anomalies of the vertebral column.

Localization
Cellulite is commonly located on the following areas:

- Thighs,
- The posterior,
- Abdomen (lower part),

- Upper limb,
- Neck.

Clinical Features
Initially, the skin is sub-cyanotic and covered with white spots. Later stages reveal a specific superficial formation known as "orange peel". When palpating the skin in the progressive stage, there is light pain, while the skin is slightly hypothermic, with the formation of eximosis.
If legs are involved, patients may feel paresthesia and have a feeling of tense and heavy legs, followed by cramps and associated pain sensation spreading up the vertebral column.
There are four stages of cellulite:

1. Congestive stage: characterized with a delay in the drainage of interstitial liquid. Tissue temperature is normal. That phase is usually reversible.
2. Exudative – infiltrating stage: characterized by slow microcirculation causing delays in the removal of catabolic waste products, which induce the loss of elasticity and softness of interstitial cells. The tissue temperature is still normal. The formation of nodules begins.
3. Fibrous stage: stasis of the circulation spreads in other areas of the cutis and subcutis, including sweating glands and *folliculi filiperi.* Teleangiectasies appear on the skin surface. The removal of toxin and catabolic products is almost blocked. The tissue temperature is decreased. The connective tissue is damaged and micro nodules become macro nodules. Local status is more progressive than in the 1st and 2nd stage. Physical examination reveals oedematous legs with "orange peel" skin surface.
4. Stage of subcutaneous cicatrisation: connective tissue in the cutis and subcutis becomes dense, solid, sclerotic and filled with the waste products, which have been accumulated due to the block of microcirculation. Tissue is hypothermic and painful on palpation. This stage is usually irreversible, and the possibility of *restitutio ad integrum* is significantly reduced. This stage of cellulite reveals proper disease, not only an aesthetic problem.

Types of Cellulite
Solid cellulite - the skin is dry and atrophic, epidermis is transparent and fragile. Cellulite is dense and poorly mobile.
Soft cellulite – most common form of the cellulite. Fluid masses are overflowing. The muscles are of poor tone, while the skin is covered with teleangiectasies, varicous veins and red and livid spots.
Oedematous from of cellulite – similar to the soft form, but contains more fluid. Usually appears on the limbs. It is important to distinguish this form of cellulite with other disease, which can cause edema. The typical sign is a niche in the skin after finger impression.
Therapeutic Procedure
LLLT significantly improves microcirculation of lymph and blood, reduces pain in the 3rd and 4th stages, and relaxes collagen fibers when applied through the adequate doses. It has been observed that the temperature of the skin reaches normal levels. The elasticity, trophy and the color of the skin become normal, too.
LLLT should be applied on the regional lymph glands, which drain the lymph from the area affected with cellulite. When treating legs, peripheral lymph glands in the inguinal and popliteal region, as well as around the ankle have to be irradiated first. The treatment of regional lymph glands is a *conditio sine qua non* in the treatment of cellulite, because they have to be unblocked first.

LLLT should be applied in a direct skin contact technique when irradiating lymph glands, and
non-contact technique for irradiation of larger surface area affected with cellulite.
It is recommended not to irradiate an area larger than 10x20 cm, depending on the
output power of the laser device. More area can be treated in one session.
LLLT can be applied with water-soluble topic substances like gel, etc.
Recommended doses
Larger surface area: 4-6 J/cm^2, HeNe (3rd and 4th stage HeNe+IR)
Lymph glands: 6-8 J/cm^2, IR
Treatments per week: 3
It is recommended to repeat the laser therapy after 2-3 months as a preventive treatment, with 30%-reduced doses per sq. cm.

The therapy of cellulite is a complex mechanism. Therefore, it is recommended to combine LLLT with the following measures:

1. Increased physical activity. Due to the decrease in the volume, there is a surplus of the skin, which has to be filled with the muscles. It is important measure for any treatment approach to the cellulite.
2. Manual massage (e.g., lymph drainage). Since lymph vessels are regenerated and the lymph glands unblocked, local excess of the fluid has to be removed to the circulation.
3. Balancing of eating and other habits (e.g., alcohol intake, and smoking). More as a preventive measure for reducing the possibility of the recurrence.

One should know that the therapeutic result would not be satisfactory for the patient, if combining only those three measures. LLLT achieves long-term results, with the reparation of damaged lymph and blood vessels.

MISCELLANEOUS

Striae

Striae can be caused by pregnancy, obesity, extensive growth process and other similar processes.
LLLT is applied in a non-contact technique, as manual or automatic scanning. The aim is to improve the regeneration of collagen fibers, through enhanced blood microcirculation.

Recommended doses
2-4 J/cm^2 HeNe, 2-3 times a week

Alopecia

LLLT can significantly improve the growth of hair, especially in the *alopecia areata*[4]. The aetiology of that disease is not well known, but it is mostly induced by hormone misbalance and stress, while local causes are infection (trichophytia), seborrhoea, etc. With regards to the skin thickness and hair follicle, the doses should be increased. Hair should be cut on the level of 0.5 – 1 cm, in order to avoid its flexion, which enhances the reflex of the laser beam. LLLT should be applied in a non-contact scanning technique.

Recommended doses

3-6 J/cm^2 HeNe + IR, if the hair has been properly cut

Wrinkles

Wrinkles are developing due to the changes in the trophy of the skin characterized by decreased production of collagen and connective tissue, leading to the loss of elasticity of the skin. The hydration of the skin is poor, while the subcutaneous fat tissue has been diminished. Aetiology reveals many factors like ageing, disease, fatigue, abuse of alcohol and nicotine, eating habits, exposure to the sunlight, nightlife, etc.
LLLT should be applied in a non-contact technique, with biostimulative and regenerative doses for the reconstruction of the connective tissue.

Recommended doses

2-4 J/cm2, HeNe, 2-3 times a week

It is recommended to repeat LLLT after couple of months, as a preventive therapy, with 30% less sessions than before.

Lentigo senile

Lentigo senile is hyper-pigmented and atrophic spots on the skin. They usually appear in advanced age on the skin that is often exposed to the sunlight. Since lentigo senile is considered to be a pre-cancerous change on the skin, LLLT is used exclusively as the preventive procedure. Elimination of lentigo senile is not possible, but biostimulative-regenerative action of LLLT inhibits further formation of those spots. LLLT should be applied in a non-contact technique.

Recommended doses

2-3 J/cm^2 HeNe, 2-3 times a week

GENERAL CONCLUSIONS

The biostimulative-regenerative effect is the most important action of LLLT in aesthetic medicine.
You are encouraged to use LLLT not only as monotherapy, but also in combination with topic substances which depth of penetration will be induced with use of laser. If those substances will be applied before LLLT, they have to be water-soluble, what is not the case if applied later. Doses mentioned above are based upon long-term clinical experience, and they can be individually increased or decreased as required. It depends upon the evaluation of the course of the treatment.
The search for beauty and eternal youth is the story of the human kind. In recent years, laser has become an indispensable part of aesthetic medicine. But, one should never forget that laser is not a magical tool, and it can achieve good results only if adequately applied by an experienced person. Last, but not least, the beauty of a person rises from internal satisfaction and healthy life, as well.

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