

LASERS IN SURGERY

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Laser beams are used in all surgical sector of the medicine, especially for minimal invasive surgery (table 1). The aesthetic plastic surgery is the sector where the laser is most frequently used. Leon Goldman and R. Gregory (1987) are among the first ones in the world to who defined the techniques of laser resurfacing for wrinkle removal. It is established that two kinds of lasers can be used for this indication, CO₂ and Erbium:YAG laser. The intention of lasers resurfacing is not to replace face-lifting but to compliment the procedure, for some specific areas of *wrinkles (periorcular, perilabial and perinasal)*. In these areas the surgical procedure could be too excessive and/or not enough to correct wrinkles. The choice of laser is made after establishing the diagnosis of wrinkles, photo-aging, skin type and general condition of the patient. The CO₂, UPW or Silk-Touch laser is preferable when is a light tissue contraction of the areas is desired, when there is poor haemostasis or the patient can not tolerate adrenaline associated with the local anaesthetic agent. The CO₂ laser with procedure of fragmented and robotized pulses (Fraxel and similar methods) increases the safety of the use for operator not expert, but this procedure cannot see the skin surface with asperity, not plan. Erbium:YAG laser is a better choice in all other cases. The same procedure is used for surgical cleansing of skin ulcers and decubitus.

Dyschromias or pigmentary changes, is the most common side effect of laser resurfacing , however in the majority of cases these are reactive by nature and clear in a few months, spontaneously or with topical bleaching agents

On the other hand, all the hyperpigmented lesions of the skin can be treated with lasers, independent of their cause. It is necessary to have many kinds of different lasers, to be able to choose the laser colour complementary to the lesion colour with appropriate energy density. The same principle is valid for tattoo removal however, the patient should be informed that it is not always possible to achieve the complete removal of a tattoo. If the tattoo pigment has changed the cyto-architecture of the dermis, the selective elimination of the pigment itself will not be able to reconstitute the dermal fibrous tissue to the same original shape. This could give rise to the so-called post-intervention phantasm tattoo, resulting in a more or less light dyschromia, not dependent upon the laser operator, but on the accuracy with which the tattoo ink was placed in the dermis.

The skin striae can be modified, improved but only in rare cases they totally disappear. The pulsed-day laser can successfully change the colour of the striae, making them less noticeable, but these lasers don not succeed in completely eliminating them. In our experience, the only stretch marks that disappeared completely are the ones seen after pregnancy, if treated immediately post-partum and those of adolescents, if treated immediately after their appearance.

Acne Scars and Post-traumatic scars have on the contrary showed an unexpected course. In the past years we proposed to treat these lesions with CO₂ CW laser in a defocused mode with sub-burn doses, or with non surgical lasers (904 nm diodes), with doses of over

8 J/cm², inhibiting the fibroblast activity in vitro. The results have been variable independent of the method used: functionally positive in 60%, but often negative from the aesthetic point of view (L. Longo, et al, 1991,1992).

The aesthetic improvement of pigmented and hypertrophic scars seems to be obtainable with flash-lamp pumped dye lasers (T. Alster, et al, 1993, 1996).

In respect to vascular ectasias, the *facial telangiectases* disappears almost in all cases, when the right parameters are used for the treatment. In almost all cases there are no side effects and/or permanent complications.

Telangiectasias of lower limbs should be treated after an accurate clinical, laboratory and instrumental diagnosis, which can verify the nature of the condition. It is estimated that on average only 30% of all the telangiectasias for which patients seek a Physician's advice, are treatable with lasers. In most other cases laser are not as effective or contra-indicated. On the other hand, the 30% of telangiectasias treatable by laser therapy cannot be e treated otherwise, without the risk of permanent complications.

Laser Hair Removal is the latest indication of laser use in aesthetic medicine but still requires some well defined parameters. Lasers cannot guarantee the total and irreversible hair elimination, because in part it depends upon the kind of hair and he area of treatment. This needs time, from a minimum of six months to a few years. The new growth and maturation slow after laser depilation. The main advantage of laser use ability to treat very large areas in a short time, with minimum inflammations and/or other side effects, with very little or no pain at all before, during and after the treatment. There are no parallel studies that prove one system of laser or luminous beam superior to the others in terms of effectiveness.

CONCLUSIONS

Lasers occupy an important place in the modern medicine and surgery and their use is destined to grow exponentially. There are some factors that limit the use of lasers such as the high costs, the need of continuous training for new technologies, the quick depreciation of the machine, the poor technical assistance, the lack of specialisation in laser biotechnology and the big confusion at mass media level. The over scrupulous doctor, as well as the well educated patient, are inclined to distrust the last miraculous instrument seen on the television or on other media forum, sponsored by our colleague who are unknown in scientific field but have experience in the field. This distrust in the technology that is very sound if used in the right way.

These conclusions are valid when the doctor is well trained in lasers, has a suitable laser machine for each clinical entity and that he/she can use them only after an accurate diagnosis has been made. An specialisation in any field of medicine does not give the necessary knowledge to use lasers, as the laser technology is in continuous evolution.

An specialisation and training in this field by all the users of lasers, would help the scientific progress enormously.

REFERENCES

Maiman T *Stimulated optical radiation in ruby*, Nature, 1960, 187:483-94

Goldman MP, Fitzpatrick RE *Cutaneous Laser Surgery: the art and the science of selective phototermolysis*, Mosby Publ, St. Louis, 1994

Anderson RR, Parrish JA *Selectives photothermolysis precise microsurgery by selective absorption of pulsed radiation* Science, 1983, 220, 524-527

Corcos L, Longo L *Combined laser and sclerotherapy for telangectases of the lower limbs* Phlebology,4:51-53,1989

Marangoni O, Longo L *Lasers in Phlebology*, IALMS publisher, Trieste, 2007