GUIDELINE FOR THE USE OF HIGH OUTPUT LASERS IN THE FIELD OF PLASTIC AND RECONSTRUCTIVE SURGERY

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Plastic and reconstructive surgery (PRS) is a field in which any congenital or acquired abnormalities in patients are corrected, including dyschromic skin lesions or tumorous lesions^(1, 2). Laser treatment is effective in such cases, however incorrect choice of lasers and incorrect use of a laser may be more detrimental than therapeutic to the patient. Recent advances in laser surgery and the increase in new laser technologies have necessitated these guidelines for the safe usage of lasers. The purpose of these guidelines is to set a safety standard for the use of high output lasers thereby securing the safety of all involved in laser treatment.

Requirements of the surgeons and medical institution for the use of high output laser

It is required of the surgeons to have full knowledge of the indications of laser treatments and usage of the laser hardware; and the laser or lasers should be installed at such medical institutions where such personnel and hardware can be provided and a safe environment for the treatment secured. Both surgeons and institutions are required to be certified by the Japan Society for Laser Surgery and Medicine and the Japan Society of Plastic and Reconstructive Surgery. ⁽³⁻⁷⁾

Indications of high output laser treatment

There are numerous diseases treatable with lasers in the field of PRS. Indications are set when the fore-mentioned surgeon has decided that the therapeutic benefits from laser surgery are greater than the associated risks and complications, whether it be a cell-selective or non-selective treatment of a specific lesion. ⁽⁸⁾

Types of high output lasers

The types of high output lasers mainly used in the field of PRS are listed below

- Argon laser
- Dye laser
- Ruby laser
- Alexandrite laser
- Nd:YAG laser
- KTP YAG laser
- Carbon dioxide (CO₂) laser
- Diode lasers with a variety of wavelengths

Of these lasers, there are those with Q-switches

attached, those which emit ultra-pulsed or super-pulsed beams and there are those which emit laser energy in continuous wave (CW).

Selection of the laser type and wavelength, and the choice of parameters differs for each lesion. Determination of the optimum parameters must be made for all new lasers. ⁽⁹⁾

Contra-indications of high output laser treatment

In PRS the following are contra-indications for laser treatment

- Laser irradiation in pregnant women
- Laser irradiation of malignant tumors *1 *2
- Laser irradiation of sensory organs such as the eyes and ears. *2
- *1 excludes cases where lasers are used as scalpels to resect the tumor
- *2 excludes cases where ocular or ENT specialists dictate otherwise

Precautions associated with HLLT

All medical and para-medical personnel associated with high output laser are required to have thoroughly read the manual and user's guide which come with the laser hardware. The facility must keep the manual and user's guide in a safe location and have it available for reading at all times. The head of the medical facility must require the Laser Safety Manager (LSM, see below) who is in charge of the manual and user's guide to ensure that all users are appropriately certified by JSLSM, and adhere to the contents of the material. In the case of malfunction of the hardware or any

complications to the patient due to such malfunction becomes evident, the LSM is required to report the event as an 'adverse incident' to the manufacturer and retailer, and to the governing agencies if necessary using the correct forms.

Management of the treatment setting

Both specular or diffuse reflected, and scattered laser energy must be appropriately managed not only during treatment but also during pre-treatment calibration. The treatment setting must be in an environment where laser energy is strictly confined to the treatment room. The treatment room must contain a sufficient number of protective goggles for all personnel in the room. When multiple lasers of differing wavelengths are used, protective goggles for each respective wavelength must be supplied. ⁽⁶⁾ Special precautions for medical hardware other than the lasers must be taken to prevent unnecessary reflection and scattering of laser light. Sufficient aspiration apparatus is required when toxic gases and fumes are anticipated during laser ablation. No flammable or combustible objects should be in the room.

Management of laser hardware

In order to prevent any erroneous laser emission, a pre-treatment check of the laser hardware must be performed before each use of the system. Additional regular power checks and mode checks must be performed routinely and not only prior to treatment. Periodic maintenance of the hardware is required.

Management of the patient

The surgeon must examine the patient thoroughly and make a diagnosis of any underlying diseases and past histories that could have any influence on the laser treatment. After the assessment, the surgeon must inform the patient of the effect and number of treatments and their duration, associated risks and possible complications. The surgeon must be aware of the position, area and depth of the lesion and the characteristics of the laser being used.

When the patient is being treated in the trunks or the limbs, protective goggles must be worn by the patient. When the head, face and neck regions are

being treated, protective eye masks made of non-combustible material must be placed over the patient's eyes. Treatment close to the eyes requires the placement of sterilized opaque contact lens-type protectors in the eyes under eye-drop topical anesthesia.

After the treatment the surgeon must check if the intended therapeutic effect was achieved and no risk of complications such as burns and hemorrhage is present.

Laser Safety Manager

The head of the laser facility must appoint a Laser Safety Manager (LSM) in order to manage the treatment rooms, laser system (s) and associated hardware and the safety of the patient. The head of the laser facility is also required to educate and train those medical personnel associated with laser treatment in order to ensure safe usage of the lasers.

The LSN is required to be a certified laser technician, certified by the non-profit organization, the Japan Society of Laser Surgery and Medicine. LSMs are also recommended to pass the Examination for Laser Equipment Engineers held by Optoelectronic Industry and Technology Development Association (OITDA).

Medical Laser Epilation Nurses

Qualified Medical Laser Epilation Nurses are authorized to treat patients for laser epilation under the supervision of either certified laser specialists, or medical doctors holding valid class 2 recognition issued by the non-profit organization JSLSM. Nurses are required to attend the Safety Education Seminar and the Laser Epilation Seminar held by the non-profit organization JSLSM and must pass the respective exams to become a Medical Laser Epilation Nurse.

Changes to the guidelines

In order to improve the safety of laser treatment these guidelines will be changed and/or amended whenever such changes become required. Any such changes shall be based on added medical evidence.

This guideline was already approved by Japan Society for Laser Surgery and Medicine, and was published in JSLSM Journal vol.28 No.1, page 17 to 38.

References

- 1: Ohshiro T, The concept of nevi, In *Laser treatment for nevi*, 2, MEL Ltd. Tokyo:1980
- 2: Skin tumors and related diseases. *Laser treatment for nevi –Types of nevi and indications for laser treatment in orthopedic, plastic surgery practice Q&A*, vol.1-501-8, Roppoh publishing, Tokyo:1983
- 3: Non-profit Organization Japan Society of Laser Surgery and Medicine, *Bylaw concerning Laser Specialist*, Tokyo:2004
- 4: Non-profit Organization Japan Society of Laser Surgery and Medicine, *Operation Rule concerning Laser Specialist*, Tokyo:2004
- 5: Non-profit Organization Japan Society of Laser Surgery and Medicine, *Laser Specialist certification Review Article*, Tokyo:2005
- 6: Non-profit Organization Japan Society of Laser Surgery and Medicine, *Operation Rule concerning Laser Specialist certification Review*, Tokyo:2005
- 7: Non-profit Organization Japan Society of Laser Surgery and Medicine, *Operation Rule Amendment concerning Laser Specialist certification Review*, Tokyo:2005
- 8: Ohshiro T, *Laser treatment for the plastic surgeon and dermatologic surgeon*,87-100, Medical view co. Tokyo:2000.
- 9: Ohshiro T, Laser Beam Parameters, *The ROLE of the LASER in DERMATOLOGY An Atlas*, 7-8, John Wiley & Sons, Chichester:1995
- 10: Optoelectronic industry and technology development association, *Laser Safety Guidebook No.3*. Advanced Communication Media; 71-75 Tokyo:2000
- 11: Ohshiro T et al, *Safety of medical lasers*, Keio Medical Laser Association, Tokyo:2000