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Lasers Use in Dermatology Practice in the Evolving COVID-19 Scenario: Recommendations by SIG Lasers (IADVL Academy)

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Abstract

The COVID-19 pandemic has taken the entire world by storm. Almost all dermatology laser procedures are considered non-essential and there is a consensus that they should be deferred till the threat of the COVID-19 is well and truly over. The article presents recommendations for the use of lasers and energy based devices in a safe manner during and in the immediate aftermath of COVID-19 pandemic. Plume generating procedures need full personal protective equipment to be used. Special precautions are required for specific laser and energy based procedures. A robust disinfection strategy based on preventing fomite borne COVID-19 transmission in the laser operating room is essential.

Keywords: *COVID-19, lasers, pandemic, personal protective equipment, safety*

The COVID-19 pandemic has taken the entire world by storm. Most of the countries are in some form of voluntary or enforced lockdown at this point of time. Most of the non emergency dermatology consultations have been discontinued or discouraged. Almost all dermatology laser procedures fall in the category of non emergency or non essential procedures, and there is an overwhelming consensus is to strictly avoid doing them till the threat of COVID-19 community transmission is well and truly over.

These guidelines have been formulated to enlist possible actions to be taken in the immediate post lockdown scenario and weeks to months thereafter, to protect the doctors, staff and patients in dermatology laser clinics and to minimize the risk of inadvertent transmission.

Screening of Potential Covid-19 Patients

Prescreening

Telephonic interview/web-based form is advisable to seek travel history and symptom check. There should be an explanation of the clinic's Coronavirus safety measures to check whether the patient will be able to comply with them. In case some patients give positive travel history in last 14 days and/or have risk factors and symptoms, it is preferable to defer the clinic visit and treatment for at least 2 weeks and the patient should be referred to physicians for further evaluation. Telemedicine can be offered to such patients in the interim period.

Signage

Signage outside the clinic/hospital disseminating general information about COVID-19 infection and directing patients with flu symptoms and travel history to avoid lasers and other procedures.

At the entrance

Infrared thermometer and pulse measurement with pulse oximeter screening for each patient is advisable. Hand sanitizer should be mandatory for each person who enters the clinic.

Screening room/Triage room

Screening room/triage room for filling self-declaration form by patient regarding travel history and relevant symptoms. A consent form outlining the measures being taken for hygiene and disinfection and absolving the treating doctor/clinic of any legal liability, if the patient were to contract

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Covid-19 while getting treatment in the clinic, should be signed by the patient. Nursing staff/ counselor with personal protective equipment (PPE) should direct the patient to a medical facility and defer treatment if found symptomatic.

If screening questions 17 are answered in the affirmative,the procedure should be deferred for at least two weeks. If question 8 and 9 are answered in the affirmative, deeper probing followed by possible deferment should be considered. Questionnaire for screening of patients is listed in Table 1.[1]

Waiting room

Waiting room should have at least 1meter distance between chairs. It should not have any nonessential items like newspapers/magazines. High contact items like pens, pads, table surface, chair, door handles, etc., should be sanitized after each patient visit.

Politely allow only one attendant to accompany the patient.

Consultation room

The patient should be shifted to the consultation room directly without having to wait much in the waiting room, which is possible by spacing out appointments appropriately. Social distancing should be borne in mind when consulting, wherever close examination is not essential.

Laser Operating Room

Relative safety of different lasers and energy based devices in COVID-19 era

1. Procedures like laser toning and carbon peels can be deferred or done with appropriate PPE/overalls as they can be considered nonessential. Moreover, plume generation is massive, especially with carbon peel. Carbon solution should be taken out in a separate disposable cup and applied using disposable brush or cotton buds, which should be discarded appropriately after use along with PPEs
2. Tattoo removal with nanosecond or picosecond lasers involve significant tissue splatter and plume generation, thus it should be deferred or done with full PPE
3. Patients undergoing an ongoing treatment of laser hair reduction can be asked to keep a longer interval between sessions. Fresh cling wrap should be used to cover the hand piece of the laser machine. Laser cooling gel should be dispensed in a disposable cup and applied using a disposable spatula, which should be discarded appropriately along with PPEs
4. Patients undergoing treatments like fractional lasers and micro needling radio frequency (MNRF), where a break in the treatment can lead to impaired results, should be done on priority. Smoke evacuators in the operating room are a must
5. High intensity focused ultrasound (HiFU),mono/bipolar/ multipolar radio frequency (RF),microwave devices for hyperhidrosis,cryolipolysis and low level laser for hair restoration can be undertaken relatively safely with PPE, as plume generation is not significant
6. Treatments on face, where the operator is in close proximity with the patient should be handled with greater care and appropriate PPE
7. Procedures involving large surface area for example full body laser hair reduction, where the operator is in contact with the patient for a longer period of time, should be discouraged and if taken up, should be done using appropriate PPE. Special precautions and PPE recommendations for common lasers and energy-based procedures are listed in Table 2.

Table 1: Questionnaire for screening patients[1]

Question	Response
1.Has someone from your close family returned from a foreign country?	Yes/No
2.Is the patient under home quarantine as advised by local health authority?	Yes/No
3.Have you or someone in your family come in close contact with a confirmed COVID-19 patient in the last 14 days?	Yes/No
4.Do you have fever?	Yes/No
5.Do you have cough?	Yes/No
6.Do you have sore throat?	Yes/No
7.Do you feel shortness of breath?	Yes/No
8.Do you have recent altered taste or smell sensation	Yes/No
9.Do you have recent onset skin rash, hives (urticaria), blisters, bruises (petechiae) or mottling (livido reticularis)?	Yes/No

Potential fomite borne spread in the laser operating room

1. The median half life of Covid-19 virus is 5.6 hours on stainless steel and 6.8 h on plastic.[2] It was detectable for upto 2 days on plastic and 3 days on stainless steel.[2] This makes laser machines a possible fomite for COVID 19 infection
2. Laser plume is an aerosol comprising of charred tissue and water vapor. Viable viruses like human papilloma virus,[3,4] human immunodeficiency virus,[4] Hepatitis B virus[4] and polio virus[4] have been reported to be found in laser plume and surgical smoke
3. The real-life transmissibility of such viral infections remain anecdotal,[4] even though human papilloma virus has been shown to transmit in vitro[3]
4. Studies have not been conducted on the viability of COVID 19 virus in laser plume, but virus RNA is known to be shed in aerosols[5] and by fecal route[6] Therefore,it is better to err on the careful side and wear a N95 mask while operating lasers, especially when dealing with oropharyngeal and mucosal/genital lesions

Table 2: Special precautions for common laser and energy based procedures

Procedure	Technology	Special precautions
Carbon Laser Peel	Q switched Nd: YAG laser	Smoke evacuator N95 mask Goggles Face shield Gown Cap Nitrile gloves Disposable brush/buds for carbon application. Clean lens with ethyl alcohol 70%
Ablative Lasers	Continuous Wave CO2 laser	Coveralls Smoke evacuator N95 mask Goggles Face shield Cap Nitrile gloves
Laser Hair Reduction	810nm, 1064nm, 755nm, Triple wavelength	Triple layer mask Goggles Nitrile gloves Disposable cling wrap for hand piece. Disinfection of machine and cooling equipment. Disposable spatula and cups for cooling gel.
Fractional Resurfacing	CO_2, Er: YAG, Er: Glass, Thulium laser.	Smoke evacuator N95 mask Goggles Face shield Cap Nitrile gloves Gown
IPL Photo rejuvenation, Mono/Bi/ Multipolar RF Firming, HiFU	IPL, Mono/ Bipolar RF, HiFU	Triple layer mask Goggles Nitrile gloves Disposable cling wrap for hand piece. Disinfection of machine and cooling equipment.
Tattoo removal	Nanosecond Q Sw: NdYAG Picosecond laser	Smoke evacuator N95 mask Goggles Face shield Cap Nitrile gloves Gown/coveralls

5. Hand hygiene and frequent had wash should be encouraged inside the laser room for both the treating doctor and support staff.

Measures to reduce laser room transmission

1. Appropriate use of PPE
2. Mandatory smoke evacuator use. This is known to reduce aerosols by 95%[4,7]
3. Keep energy levels for lasers at the lowest therapeutic levels to reduce plume formation[8]
4. Use disposable materials like cling wrap on the contact surface of lasers, wherever possible
5. Cover machine body with disposable plastic (barring the exhaust area) to safeguard the internal panels
6. Strict disinfection of all surfaces, equipment, table tops, door knobs, glasses, phones, etc., in the room after each treatment
7. Deep cleaning of room at the end of the working day, by removing all machines, beds, stools, and chairs from the room and spraying of sodium hypochlorite solution on all surfaces including floor, doors, windows, curtains, and cabinets
8. Powder free nitrile gloves should be worn by the operating doctor, support staff and patient for each procedure
9. Patient should also be made to wear a gown/overall as his/her clothes will come in contact with multiple surfaces during the procedure
10. To improve airflow in the operating room and to encourage 12 air changes per hour, use a strong exhaust fan and air conditioning
11. Air conditioner should be a stand alone unit for each room and not part of a central air conditioning system
12. Place the head end of the patient bed close to the exhaust fan, so the aerosols generated by the patient's breath are taken up by the exhaust quickly. Air conditioning vent should preferably be at the opposite end to establish an uninterrupted airflow stream.

Disinfection of laser operating room, laser equipment and other surfaces[9]

All surfaces coming in contact with the patient including beds, switches, door handles etc. should be cleaned with 1% sodium hypochlorite solution[6] or 70% ethyl alcohol based disinfectants. Damp swab all surfaces, allow contact time of 30 minutes and allow to air dry.

All laser and other machines e.g. laser hand pieces, tubing, body of the machine, should be cleaned with 1% sodium hypochlorite solution after each procedure. The optics of laser, lens, and sapphire cooling tip on the hand piece should not be cleaned with sodium hypochlorite, instead 70% ethyl alcohol should be used to clean them. In addition, laser machine surfaces that come in contact with the patient like hand pieces, tubing should be cleaned with 70% ethyl alcohol before starting the next procedure. Wait for the alcohol to evaporate visibly and then start the treatment. Guidelines for preparation of 1% sodium hypochlorite solution are given in Table 3.[9]

Fumigation of clinic procedure room

Clinic procedure room should ideally be fumigated at the end of each working day and sealed overnight by using formaldehyde vapor which is produced by heating of commercially available 40% formalin solution

(500 ml of 40% formaldehyde mixed with 1 liter of water for 1000 cubic feet space).[10] Neutralization is done with 300 ml of ammonia for each1 liter of formaldehyde used.

Optimal use of PPE

PPEs comprise of protective gear designed to safeguard the health of workers by minimizing the exposure to a biological agent. Components of PPE are goggles, face-shield, mask, gloves, coverall/gowns (with or without aprons), head cover, and shoe cover [Tables 4 and 5].[1,11]

Specifications of PPE for Health Workers in a Laser Dermatology Clinic

Choosing the right PPE for the different areas/workers of a laser clinic is important to rationalize the cost and will also help preserve PPE for frontline health workers. These recommendations [Table 4[1]] from Govt. of India (Ministry of Health & Family Welfare) can act as our guide.

Recommendations for common areas are available, though there are no specific recommended guidelines for use of PPE in laser operating rooms.

1. Still, it is wise to use full PPE in aerosol & plume producing or wound producing procedures like ablative lasers, fractional ablative lasers, vascular lasers, and ablative RF cautery[1]
2. For non-ablative procedures like Q-switched Nd:YAG laser, RF skin firming and HiFU, N95 mask, goggles, and gloves are recommended[1]
3. Masks for laser procedures: N95 mask filters out 95% of aerosols when exposed to 0.3 micron particles and are therefore is suitable for keeping out viruses and other fine particles in surgical smoke.[4] Ideally to be used by health care staff who are in close contact with the patient. Triple layer surgical mask can filter out only droplets larger than 5 microns and is suitable for use by patients to prevent spread of droplets.[4] N 95 mask should be covered with a triple layer mask, that

Table 3: Guideline for preparation of 1% sodium hypochlorite solution[1]

Product	Available chlorine	1 percent
Sodium Hypochlorite -liquid bleach	3.5%	1 part bleach to 2.5 parts water
Sodium Hypochlorite - liquid	5%	1 part bleach to 4 parts water
NaDCC (Sodium dichloro-isocyanutrate) powder	60%	17 grams to 1 litre water
NaDCC (Sodium dichloro-isocyanutrate) tablets	60%	11 tablets to 1 litre of water
Chloramine powder	25%	80 gram to 1 litre of water
Bleaching powder	70%	7 grams to 1 litre of water

Table 4: Rational use of PPE for different areas of the clinic[1]

Setting	Activity	Risk	Recommended PPE	Remarks
Health Desk	Provide information to Patients	Low	Triple Layer Mask Gloves	Min. Distance of 1 meter to be maintained
Screening Area	Screen symptomatic patients	Moderate Risk	N 95 Mask Gloves	
Triage Area	Triaging patients Provide Triple Layer Mask	Moderate Risk	N 95 Mask Gloves Goggles	Patient Gets Mask.
Waiting Area	Nurses/paramedics interacting with patients	Moderate Risk	N 95 Mask Gloves	Min. Distance of 1 meter to be maintained Patient wears mask.
Consultation Room	Clinical management (Doctors, Nurses)	Moderate Risk	N 95 Mask Gloves Goggles	No aerosol generating procedure should be allowed. Patient wears mask.
Laser Operating Room 1.Continuous wave CO^2 laser 2.Fractional.CO2/Er: YAG, Er: Glass laser, Thulium laser 3.Q Sw Nd: YAG	Laser plume/aerosol generating procedures	High Risk	Full Complement of PPE N95 Mask Goggles Face shield Cap Coverall Shoe covers	Aerosol generating Patient gets mask and gown.
Laser Op. Room 1.Laser hair reduction 2.IPL 3.RF skin firming 4.HiFU	Non aerosol generating procedures	Moderate Risk	N 95 Mask Gloves Goggles	Patient gets mask. No aerosol generating activity

Table 5: PPE KIT[1]

PPE	Properties	Quality compliance standards
Gloves	Nitrile Non-sterile Powder free Outer gloves preferably reach mid-forearm (minimum 280 mm total length)	a. EU standard directive 93/42/EECClassI, EN455 b. EU standard directive 89/686/EEC Category Ill, EN 374 c. ANSI/SEA 105-2011 d. ASTM D6319-10
Coverall	Impermeable to blood and body fluids Single use Light colors are preferable to better detect possible contamination Thumb/finger loops to anchor sleeves in place	Meets or exceedsISO 16603 class 3 exposure pressure, or equivalent
Goggles	With transparent glasses, zero power, well fitting, covered from all sides with elastic band/or adjustable holder. Good seal with the skin of the face Flexible frame to easily fit all face contours without too much pressure Covers the eyes and the surrounding areas and accommodates for prescription glasses Fog and scratch resistant Adjustable band May be re-usable (provided appropriate arrangements for decontamination are in place) or disposable	a. EU standard directive 86/686/EEC, EN 166/2002 b. ANSI/SEA Z87.1-2010
N 95 mask	Shape that will not collapse easily High filtration efficiency Good breathability, with expiratory valve	For medical N95respirator: a. NIOSH N95, EN 149FFP2, or equivalent Fluid resistance: minimum 80 mmHg pressure based on ASTM F1862, ISO 22609, or equivalent
Triple layer medical mask	Three layered medical mask of non-woven material with nose piece, havingfilter efficiency of 99% for 3 micron particle size	
Shoe covers	Made up of the same fabric as of coverall Should cover the entire shoe and reach above ankles	
Face shield	Made of clear plastic and provides good visibility to both the wearer and the patient Adjustable band to attach firmly around the head. Fog resistant (preferable) Completely covers the sides and length of the face May be re-usable (made of material which can be cleaned and disinfected) or disposable	a. EU standard directive 86/686/EEC, EN 166/2002 b. ANSI/SEA Z87.1-2010
Head cover	Coveralls usually cover the head. Those using gowns, should use a head cover that covers the head and neck while providing clinical care for patients	

needs to be changed after each procedure, to prevent contamination of the N95 mask. Facial hair affects the efficacy of the mask as they do not allow air tight sealing.

Disposal of PPE

1. Sequential donning and doffing steps for PPEs should be followed
2. Donning sequence: Gown→mask→goggles/face shield→gloves[12]
3. Doffing sequence (example1): Gloves→goggles/face shield→gown→mask→hand hygiene[12]
   (Example 2): Gown and gloves→goggles/face shield→mask→hand hygiene[12]
   If hands touch any contaminated surface of PPE (for example front or sleeve of gown) then hand hygiene should to be practiced before moving to the next step.
4. Disposal of biomedical waste should be done via incineration and standard guidelines
5. Discard in bio/hazard bag. The interior of the bag should be sprayed with 1% sodium hypochlorite solution. The bag should be tied, and exterior should be decontaminated with 1% sodium hypochlorite[8]
6. The laser operating room should have a disposal bin
7. PPE should be disposed after each procedure or session based on the level of danger/exposure, for example, for nonablative lasers and energy based devices (nonaerosol/nonplume producing procedures)

only gloves and masks need to be changed after each procedure and goggles cleaned with disinfectant, gowns, shoe covers can be changed after a session/daily once. For aerosol/plume producing procedures like ablative lasers, full PPE should be changed after each procedure.

Extended Use of N-95 Mask

Ideally N-95 masks are meant for single use only.

To conserve PPEs, a set of 5 masks can be issued to each person, along with 4 breathable paper bags. After use of first mask, it should be placed in the paper bag and allowed to dry for 4 days. It should be reused on day 6. Use the 5 masks sequentially and once all masks have been used 5 times, they should be discarded.[13]

Alternatively, vaporous hydrogen peroxide and UV germicidal radiation(UVC 254nm), if available can be used for decontamination of the N-95 mask.[13]

Screening and Training of Clinic Staff

Any staff member showing symptoms suggestive of COVID-19 should be put on 14-day home quarantine. If staff strength is adequate, another option is rotational shifts of staff members, for example staff can be divided into two teams that remain 7 days on duty and next seven days off duty. Staff should be screened for COVID-19 symptoms upon return for the shift.

Arrange staff training for hand hygiene, PPE and basic scientific information about Covid-19.

Support staff psychologically to keep their morale high as they may be concerned about the possible transmission to their family.

Epilogue

The decision about when to start doing nonemergency laser and other energy based procedures should be taken keeping in mind the ease of availability of PPE for frontline healthcare providers dealing with COVID 19.Till the time there is inadequate availability of PPE and/or high number of reported cases in your area or if your area is a declared as a containment or buffer zone, laser procedures in dermatology practice should be deferred.

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Conflicts of interest

There are no conflicts of interest.

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