Guidelines for refractive surgery with excimer and femtosecond lasers and for treatment with cross-linking during the COVID-19 pandemic in Mexico

Guías para cirugía refractiva con láser excimer, femtosegundos y tratamientos de cross linking en pandemia de COVID-19 en México

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Abstract

The severe pandemic caused by the respiratory coronavirus SARS-CoV-2 (COVID-19) is currently a major problem in all elective surgery clinics, including those that perform refractive surgery, which has been rescheduling most of their procedures for a long time due to high morbidity and mortality. Currently, due to changes in the knowledge of the disease, as well as protective measures with barriers, many refractive surgery clinics have restarted their procedures without yet having a consensus about protection for doctors and patients. This work aims to adapt the international information of the existing guidelines, as well as to provide recommendations that can be applied and be useful for the practice of these procedures in Mexico.

Key words: COVID19. Preferred practice. Refractive surgery. Guidelines.

Resumen

La grave pandemia causada por el coronavirus respiratorio SARS-CoV-2 (COVID-19) es actualmente un problema muy importante en todas las clínicas de cirugías electivas, incluida la cirugía refractiva, las cuales han reprogramado la mayoría de sus procedimientos por un tiempo prolongado debido a la alta morbilidad y mortalidad. Actualmente, gracias a los cambios en el conocimiento de la enfermedad, así como a los cuidados con barreras de protección, muchas clínicas de cirugía refractiva han reiniciado sus procedimientos sin contar aún con un consenso en cuanto a protección para médicos y pacientes. Este trabajo pretende adaptar la información internacional de las guías existentes, así como aportar recomendaciones que puedan aplicarse y ser de utilidad para la práctica de estos procedimientos en México.

Palabras clave: COVID19. Prácticas preferidas. Cirugía refractiva. Guías.

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Introduction

COVID-19, caused by a coronavirus discovered in China at the end of 2019 and which has caused a pandemic with more than 800,000 deaths until September 2020¹, had its first confirmed case in Mexico on February 27, 2020, with a subsequent significant increase of cases over the months. Currently, Mexico is among the countries with the highest number of cases and the highest mortality².

The transmission mechanism established to date is mainly through droplets generated when an infected person coughs, sneezes, or speaks, and these come into contact directly with the mucosa of the upper respiratory tract, or indirectly by fomites. In addition to these mechanisms, it is believed that another route is airborne transmission in closed and crowded places. Also, the respiratory system should not be considered the only route of transmission since tears and the fecal-oral route are other potential routes of entry³. Conjunctivitis is not a frequent manifestation of the disease but contact with infected eyes could be a route of transmission, and as a consequence, ophthalmologists must have prevention strategies both in the office and in the operating room, for all types of surgery, including refractive surgery⁴. Although the possibility of contagion via the ocular surface is believed to be low, angiotensin-converting enzyme 2 receptors have been documented on the surface of the eye⁵, as well as infected conjunctival cells in ex vivo human cultures⁶. In tears, it is difficult to estimate viral shedding, since the window period may be short⁷, and therefore, during laser refractive and cross-linking procedures in which the ophthalmologist is close to the patients, there can be contact with tears that are dispersed in the form of drops or aerosols, and with surgical smoke with fine particles produced by lasers, so some guidelines and recommendations for prevention during ophthalmology consultation and refractive surgery are established below.

The measures that can be taken in hospitals and clinics where refractive surgery and cross-linking are performed are presented below, in accordance with the recommendations in the literature and what has been observed in the clinical practice.

General measures for clinics and hospitals where refractive procedures are performed

Prehospital

- Control of the number and scheduling of appointments by phone to avoid saturation of patients and a longer stay in the hospital.

- Interrogate by telephone about the symptoms of patients entering the clinic, consider online questionnaires that include questions about traveling, fever, cough, recent difficulty breathing, loss of smell or taste, both for patients and companions.
- Control management of spaces and waiting rooms in the hospital to maintain a minimum distance of 2 meters between patients.
- Inform patients about online payment methods to reduce hospital stay time and minimize contact with bills and coins.

At the hospital

FOR PATIENTS

- Mandatory mouth cover for patients and families.
- Entry only of essential companions in case of patients with mobility problems or surgery companion (only allow entry of one relative per procedure).
- Temperature taking by means of an infrared gun to all patients and companions who enter the hospital.
- Antibacterial gel, if possible, in an automatic dispenser to avoid contact, at the entrance and at various strategic points in the clinic or hospital.
- Social distancing preferably greater than 2 meters in all areas, such as pharmacy, laboratories, reception, mobility areas, and waiting areas.
- Symptom control area, where pulse oximetry, symptom questionnaire, and temperature are taken.
- Provide to both the patient and the companion the data of the COVID 19MX application of the Ministry of Health to access the telephone number for epidemiological health care, self-diagnosis, and location of care centers.

CONSULTING AREAS

- Protection of the slit lamps with a plastic covering between the patient and the physician, and requesting patients not to speak during the slit lamp examination (Fig. 1).
- Hand washing before touching the patient, before performing a clean/aseptic task, after the risk of exposure to body fluids, after touching the patient and after contact with the patient's surroundings.
- Disinfection of tonometers with 70% alcohol⁸, waiting at least 1 minute before use, or use of a tonometer with a disposable cover, such as Tono-Pen®.
- Reduction of the consultation modules to increase the distance between patients and doctors to 2 meters.

Figure 1. Slit-lamp plastic spacer, easy to make and adapt for different types of lamps.

INTRAHOSPITAL MEETING ROOMS AND OFFICES OF SPECIALTY DEPARTMENTS

- Always keep open for ventilation.
- Minimum staff and more than 2 meters between them.
- Constant disinfection of surfaces and equipment.

TOPOGRAPHY AREAS

- Limit the admission of patients for topography and tomography tests to one patient per study.
- In the case of using another instrument, such as ultrasound, optical coherence tomography or confocal microscopy, only one patient may be admitted while keeping a spacing greater than 2 meters between each device, as well as between patients, physicians and technicians.
- Given the difficulty of placing plastic shields on the topographer, the technician who performs the topography must wear, in addition to a face mask, a plastic acetate protector for the face.

REFRACTION AREA

- Disinfection of the phoropter and autorefractor with 70% alcohol⁸.
- Acrylic protectors in the phoropter to reduce aerosols when refracting.
- For cycloplegia, multipurpose drops must be put away between patients to avoid contamination⁹.

FOR HOSPITAL EMPLOYEES

- All personnel involved must wear face masks, protective glasses, headgear, and gloves at all times. Each hospital or clinic can establish information guidelines on protective barriers and make this information available to all its employees.
- Use of gel or hand washing before and after coming into contact with patient's objects.
- Greet patients keeping the recommended distance instead of shaking hands.
- Keep doors and windows open to allow free flow of air.
- Clean all surfaces (chairs, tables, keyboards, computer monitors) with disinfectant solutions at regular intervals.

Surgery scheduling

- Examiner with N95 mask and protective glasses, and patient with a mandatory mask.
- Pinhole occluder and chin rest and forehead support for the autorefractor disinfected with 70% alcohol between patients⁸.
- During refraction, avoid leaning on the patient when measuring the working distance and avoid speaking during the evaluation.
- Use an autorefractor during the examination to complement and reduce the time in the phoropter, which must have a plastic barrier.
- Disinfect the chin rest and forehead of the slit lamp with 70% alcohol between each patient and wait at least 1 minute before using it again⁹.
- The prism of the Goldman tonometer of the lamp, in addition to disinfection with alcohol, must be disinfected with sodium hypochlorite 1:10 at the beginning and the end of each day's consultations.
- In the case using an air tonometer, it is important to place a barrier protection between the patient and the physician.
- Disinfect the retinoscope handle and plastic area between patients, avoiding touching the mirror, with 70% alcohol.
- The signed consent form for surgery must have an annex containing information on COVID-19 and the risk of contagion.

Preoperative

- On the day of the procedure, all the steps already described must be carried out prior to arrival at the hospital.

- The questionnaire of symptoms and contacts with COVID-19 patients is verified in writing, as well as the signature of the patient.
- During admission for the patient:
 - Change of mask.
 - Taking temperature, vital signs, and oxygen saturation with a pulse oximeter.
 - Provide disposable surgical caps, pajamas, and boots.

In the general area of operating rooms and the transit areas between them

- Use of protective equipment for medical personnel in accordance with general operating room recommendations, with a gown, gloves, and a cap, as well as protective glasses or goggles.
- Double face mask, one KN95 and another surgical tri-layer mask on it.
- Surgical pajamas made of disposable materials for physicians, nurses, and stretcher-bearers as well as for patients, to avoid fomites.
- The patient must use a mask, preferably type N95.

Intraoperative precautions in the refractive operating room for excimer and cross-linking

- 0.25% povidone-iodine instillation in the cul-de-sac 10 minutes before surgery. It is virucidal and minimally affects the ocular surface¹⁰.
Ensure the formation of a separation chamber to avoid the dispersion of aerosols by the microkeratome or the irrigation of the ocular surface, as well as reduce the dispersion of particles from surgical smoke and patient and surgeon breathing, using a transparent plastic bag of polypropylene that can be sterilized by ethylene oxide, between the patient and the surgeon, previously cut to adapt to the shape of each excimer equipment¹¹ (Figs. 2 and 3). During the placement of the plastic barrier, it is essential not to occlude the excimer ventilation areas to avoid malfunction (Fig. 4).
- Perfectly cover the patient with disposable sterile drapes.
- Asepsis of the patient's face and hands.
- Explanation of the procedure, clarification of doubts and comments before entering the operating room. Inside the operating room, it is forbidden to speak.
- The physician (Fig. 5):
 - Safety glasses, KN95 mask, and triple-layer mask.

Figure 2. Sterilized plastic barrier to act as an isolation chamber during the use of the excimer laser.

Figure 3. Plastic barrier placed in the femtosecond laser used for de-epithelialization during cross-linking prior to the application of ultraviolet light.

- Surgical uniform and gown.
- Regular hand washing.
- Cap that ensures total hair coverage.
- Handwashing after the surgical procedure.
- Removal of the surgical uniform in a specific order.
- Change gown and wash between patients.
- Have several boxes of sterilized equipment so that instruments and materials are not reused.
- Maintain a constant distance between the assistants in the operating room.
- Prefer to use the monitor for viewing if possible, during microkeratome cutting to avoid aerosols, as well as while using the laser, to reduce, together with

Figure 4. The two upper boxes show thermographic images of the interior of the plastic barrier where the patient is by means of a Flir One Pro thermographic camera (thermal resolution 160×120 , optical resolution 1440×1080), showing that it does not rise significantly given that it is not completely hermetic, but it fulfills the function of reducing the drops generated by the microkeratome. The two lower boxes show the unoccluded excimer ventilation areas with the barrier already in place so as not to affect the temperature of the equipment.

Figure 5. Surgical uniform removal sequence.

the exhaust fan, the exposure to particles generated by the laser¹².

- Avoid excessive irrigation of the interface to not generate an accumulation of solutions with tears and consider that irrigation can generate aerosols¹¹.
- At the end of the procedure, clean the patient's bed with disinfectants. Surrounding floors should be cleaned and allowed to dry after surgery.
- When cleaning the area, take care not to spray disinfectant products on the excimer lenses, and clean

them between each patient according to the cleaning and maintenance manual for each specific excimer.

- If femtosecond lasers have been used, discard the materials used for each patient, such as the suction cup and tubes, depending on each laser system.
- In the case of cross-linking, the laser microscope can be used to de-epithelialize with the same plastic separation system between the patient and the surgeon.
- Consider, both for PRK and cross-linking, placing the plastic barrier between surgeon and patient given the

aerosols generated by irrigation to remove the diluted alcohol during de-epithelialization.

- In cross-linking, cover the entire plastic part of the lamp, except for the area of the lens that administers the ultraviolet light, with a sterile disposable plastic, that must be changed between patients.
- At the end of the surgical day, in addition to general cleaning of the operating room, if possible, keep an ultraviolet light on at night¹³.

Postoperative care

In addition to the usual care, consider reducing post-operative visits to the bare minimum, with the possibility of video consultation for non-urgent questions.

Maintain the preoperative measures of distancing and cleaning of equipment, as well as the protective measures for medical personnel and other employees of the clinic or hospital.

All of the above interventions are prone to failure and therefore require data feedback to maintain fidelity, making it imperative to report any errors.

It is convenient to follow up with the patient and his companion by telephone, questionnaires, or free applications for Android or IOS systems.

Conclusions

Although refractive surgery is an elective procedure, it is essential to consider the gradual recovery of these surgeries and ophthalmology consultations for the different specialties. The development of dynamic guidelines, which can be modified according to the updated and adapted knowledge for each country, will make possible the option of reducing risks both for ophthalmologists and staff working in clinics and hospitals, as well as for patients, of whom it is also essential to gradually regain confidence for these procedures.

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Conflicts of interest

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Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

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