

Surgical activation protocol COVID-19 (SAP COVID)

Protocolo de activación quirúrgica COVID-19 (PAQ COVID)

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Abstract

Background: The coronavirus disease 2019 (COVID-19) outbreak have major implications in conventional surgical practice. As the number of patients with this diagnosis is rising, the infection risk for the surgical staff will be higher. Few publications have addressed the surgical management of patients diagnosed with COVID-19. **Objective:** To assess recommendations for care of patients and surgical team during the COVID-19 pandemic. **Method:** MEDLINE, Embase and the Cochrane Database of Systematic Reviews (April 2020) were searched the key words "COVID-19", "PROTOCOL" and "SURGERY". Relevant recommendations, guidelines and cases series were checked for the most accurate information for apply to our center. **Results:** We found 379 papers that included the key words. A total of 25 papers were included in the manuscript based in the pertinence of the recommendations. Three major topics were selected: perioperative, intraoperative and postoperative. **Conclusion:** As an attempt to regulate the surgical team approach, we present recommendations to preserve patients and surgical staff safety with high quality standards of care through reproducible strategies applicable in most hospital centers.

Keywords: Surgery. COVID-19. Protocol. Operating room.

Resumen

Antecedentes: La pandemia de COVID-19 ha tenido un gran impacto en la práctica quirúrgica convencional. Conforme el número de pacientes diagnosticados con esta enfermedad vaya en aumento, el riesgo de contagio para el equipo quirúrgico será mayor. Pocas publicaciones han abordado el manejo del paciente diagnosticado con COVID-19 dentro del quirófano. **Objetivo:** Evaluar las recomendaciones para el cuidado de pacientes y del equipo quirúrgico durante la pandemia de COVID-19. **Método:** La búsqueda bibliográfica principal utilizó las bases de datos MEDLINE, Embase y Cochrane, utilizando las palabras clave "COVID-19", "PROTOCOL" y "SURGERY". Se verificaron recomendaciones, guías y series de casos relevantes para obtener la información más precisa y aplicable. **Resultados:** Se hizo la revisión de 379 artículos que contenían las palabras clave. Se incluyeron 25 artículos basándose en la pertinencia de las recomendaciones. Los tres temas principales seleccionados fueron las fases preoperatoria, transoperatoria y posoperatoria. **Conclusión:** En un esfuerzo por tratar de normar el manejo quirúrgico, presentamos recomendaciones para preservar la seguridad del paciente y del equipo quirúrgico con estándares de alta calidad, mediante estrategias reproducibles en la mayoría de los centros hospitalarios.

Palabras clave: Cirugía. COVID-19. Protocolo. Sala de operaciones.

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Introduction

Up to June 12, 2020, 7,778,078 people have been infected with COVID-19 in 188 countries. In Mexico, 133,974 cases have been confirmed, leaving a trail of 15,944 deaths so far¹. COVID-19 has drastically changed the way institutions manage surgical services. Elective procedures have been postponed in order for emergency surgeries to be prioritized and, consequently, reduce the risk of surgical staff exposure². Considering the scope of this pandemic, it is prudent to think that surgical emergencies in patients with suspected or diagnosed COVID-19 will be increasingly frequent. It is necessary for our conventional practice to be reformulated in order to continue providing quality care in a way that is safe for the surgical staff, making proper and rational use of personal protective equipment (PPE) and supplies. In this article, we present the fundamental strategies for performing surgical interventions in patients with diagnosis or suspicion of COVID-19. Due to economic or infrastructural differences, some recommendations may not be directly applicable at all institutions, but their fundamentals can be adapted according to the particular circumstances of each center.

Method

Literature review

The authors gathered in March 2020. The topics for the inclusion studies were agreed upon and assigned. The main literature search used the MEDLINE, Embase and Cochrane databases to identify relevant contributions published from January 2020 to the present day. The Medical Subject Headings (MESH) terms were used, as were entry terms. The keywords were "COVID-19", "PROTOCOL", "OPERATING ROOM" and "SURGERY". The reference lists of all eligible articles were verified.

Selection of studies

Titles and abstracts were screened by individual reviewers to identify potentially relevant articles. Judgment discrepancies were solved by the main author during the surgical activation protocol COVID-19 (SAP COVID) working group committee meetings.

Results

Virus transmission

SARS-CoV 2 main routes of transmission are summed up in two: 1) inhalation of aerosol droplets expelled when coughing, talking or breathing^{3,4}, and 2) direct contact with contaminated surfaces, such as plastic and stainless steel, where the virus can linger active for up to 72 hours⁵. Although viral RNA has been identified in extrapulmonary tissue (feces, blood, gastrointestinal tissue and peritoneal fluid), no transmission route additional to respiratory transmission has been formally confirmed⁶⁻⁸.

Personal protective equipment

PPE should entirely cover the skin, eyes, nostrils, and mouth. PPE includes gloves, waterproof gown, FFP2/ FFP3 masks, goggles, face shield, gloves, headgear and boots. All personnel within the operating room (OR) are to use these protective measures (Fig. 1)⁸. Putting on and taking off PPE must be supervised, in addition to having a specific sequence and special area for it⁸. Determining COVID-19 cross-contamination risk levels will decrease PPE inappropriate use.

Sequence for putting on and taking off PPE (donning-doffing)

We base our recommendations for PPE donning and doffing sequence to be carried out according to the technique described by Balibrea et al.⁹. Figure 1 summarizes these sequences in the OR. Between the removal of each PPE item, clinical handwashing with an alcohol solution should be carried out.

Characteristics of the COVID-19 operating room

The risk of transmission decreases when using the same OR and the same anesthesia machine¹⁰, which is why an exclusive OR area is assigned for patients with COVID-19. However, in centers where this conversion is not possible, a single OR will be used throughout the pandemic. The OR should be easily accessible, with an established and signposted route. Using a negative pressure system is recommended, and if not available, a laminar flow system with more than 20 air change cycles/hour will be an alternative¹¹.

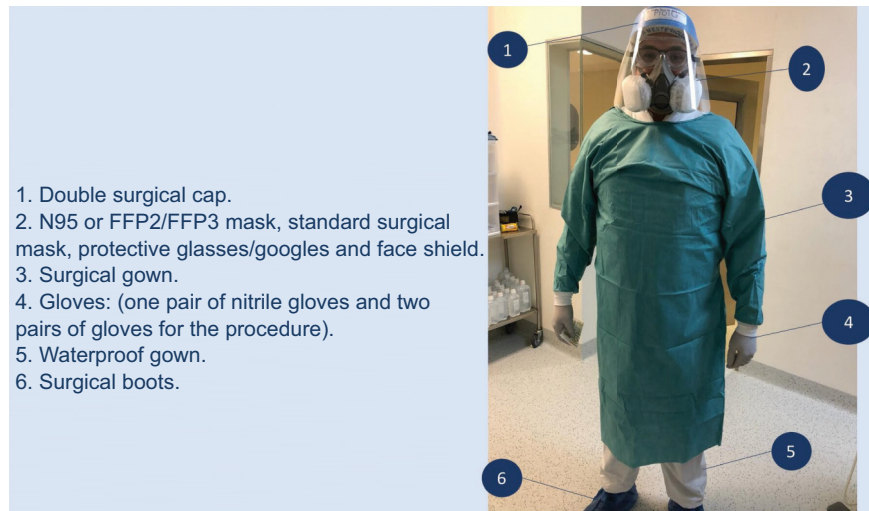


Figure 1. Personal protective equipment.

Preoperative phase

1) Patient preoperative evaluation

Cancellation of non-essential appointments and elective procedures is recommended, since COVID-19 progression could accelerate and exacerbate¹². In case surgery deferral prolongs hospital stay, the risk of complications increases or medical management has failed, emergency surgery should be carried out¹¹.

Patients with a clinical picture of cough, fever ($\geq 38^{\circ}\text{C}$ or 100.4°F) and headache are considered to be suspicious cases who need to be hospitalized, as well as those with clinical or radiographic signs of consolidation not explained by another infection, and who within the preceding 10 days have an epidemiological history of contact with a probable or confirmed case¹³ (Fig. 2).

Chest computed tomography systematic performance should be considered as a diagnostic support for symptomatic COVID-19 patients, but, so far, it has not been shown to be a first-line diagnostic procedure^{14,15}.

Thorough anamnesis is also carried out in order to identify risk factors for developing severe disease, such as chronic obstructive pulmonary disease, hypertension, diabetes mellitus, chronic kidney disease¹⁶ or oncological diseases in patients who have undergone surgery or have received chemotherapy¹⁷. The use of nonsteroidal anti-inflammatory drugs at early stages of the disease has been associated with serious cardiac and pulmonary complications¹⁸.

2) Preparation phase

It starts one hour before the procedure and, during this time, the route is cleared and access to personnel is restricted. Nursing professionals in the isolation area are responsible for patient transport. In case of being in the intensive care unit (ICU), the patient must be accompanied by an intensivist, who will transport him/her directly to the OR. The use of a transfer ventilator is recommended for patients requiring mechanical ventilation; otherwise, the patient will only wear an N95 mask and surgical cap (the use of masks with reservoir should be avoided). At the time of changing ventilators, endotracheal tube occlusion is recommended¹⁹. The use of closed transport systems (isolation capsules) (Fig. 3) has not been shown to be beneficial, but in case this resource is available, it can be used because it represents an additional physical barrier between staff and patient. The circulating nurse takes care of maintaining free access for the patient, and also helps the instrument nurse to prepare and open out the surgical table before patient arrival. The anesthesiology staff prepares the necessary material and makes a second inspection of the anesthesia machine in case induction is required. Performing a double examination of patient safety procedures is suggested. We recommend the use of an aerosol box for intubation and extubation.

Intraoperative phase

This period starts with patient arrival at the OR. To reduce the risk of exposure, we recommend the following strategies:

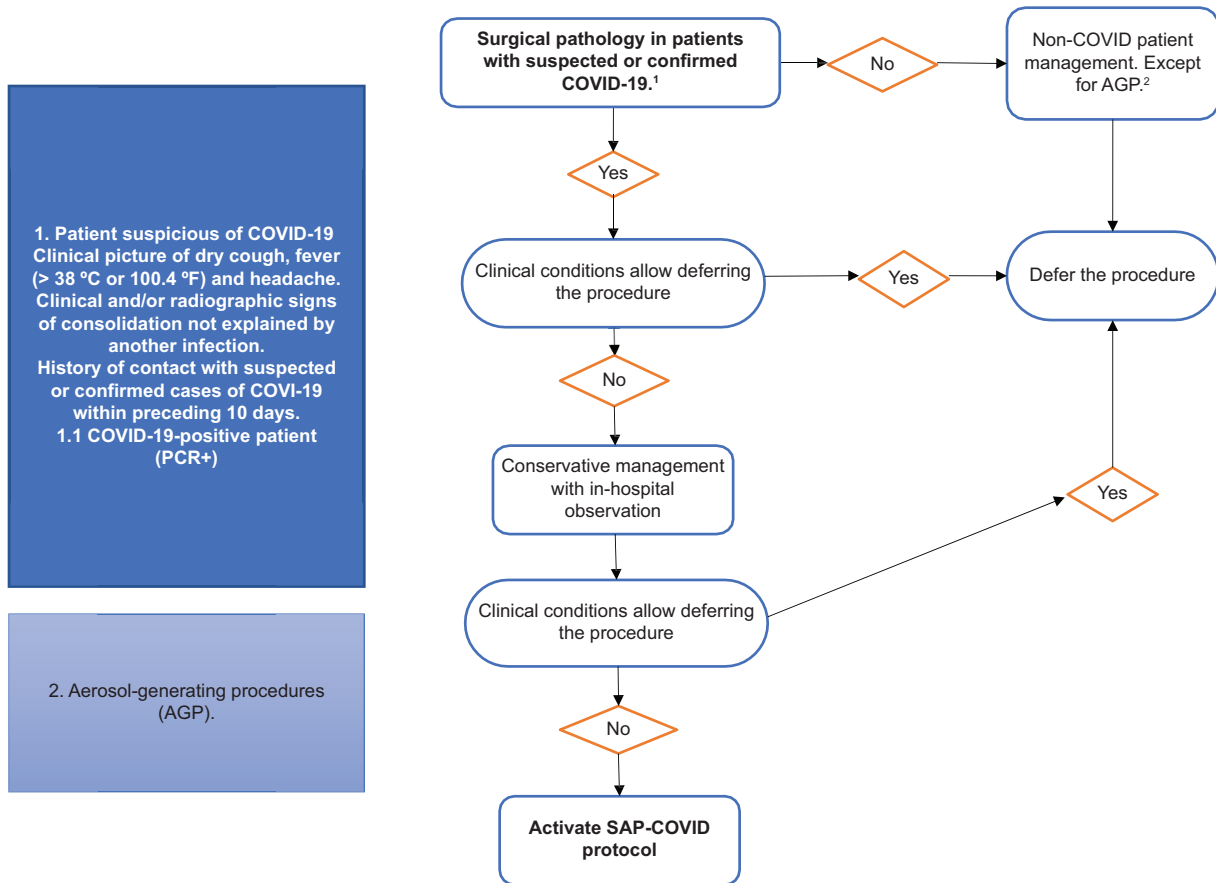


Figure 2. Flowchart to determine surgical protocol activation in patients with suspected or diagnosed COVID-19. PCR: polymerase chain reaction; AGP: aerosol-generating procedures.



Figure 3. Patient transport in isolation capsule.

1) SAP-COVID team

The working team should be made up of the following participants: external circulating nurse, circulating

nurse, instrument nurse or scrub tech, main anesthesiologist, anesthesiology assistant, operating surgeon and surgical assistant. Total number of members will be assigned depending on the surgical procedure. OR entry and exit, as well as the degree of risk, are summarized in table 1.

2) Types of surgical approach

Exposure risks should be taken into account when making the decision between open or laparoscopic surgery; evidence is limited to a series of reported cases of highly fluid-transmissible viral diseases¹⁰.

Due to the benefits of minimally-invasive techniques, such as shortening hospital length of stay and reducing physical contact between the surgeon and the possible source of infection, their use is not ruled out. In case of using them, the following is recommended:

- Use low pneumoperitoneum pressures without limiting the surgical field view¹¹.
- Small enough incisions to let the trocar pass and prevent carbon dioxide leakage¹¹.

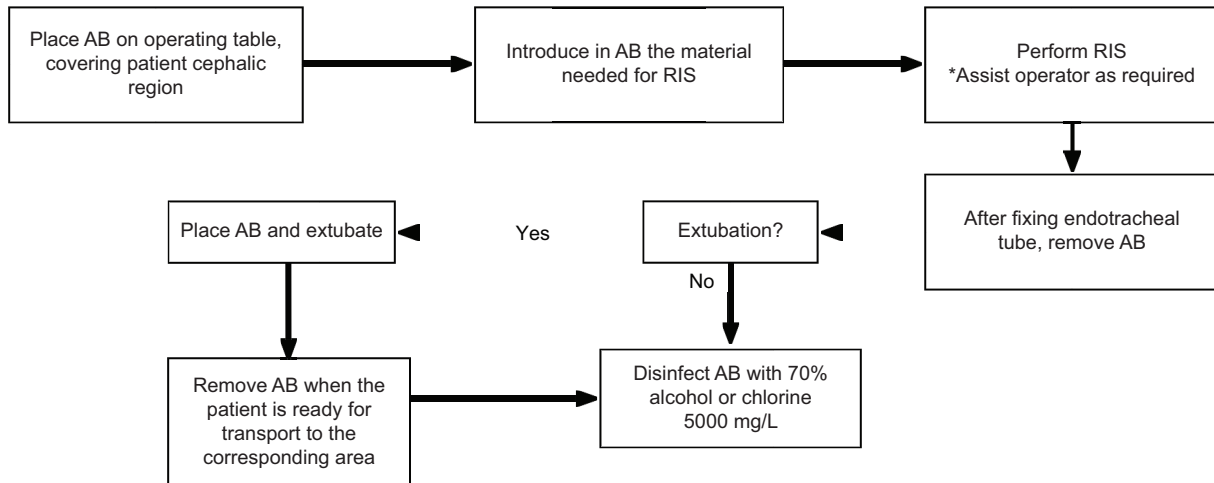


Figure 4. Use of the aerosol box in the intubation and extubation sequence. AB: aerosol box; RIS: rapid intubation sequence.



Figure 5. Rapid intubation sequence using the aerosol box.

barrier between the physician who performs the rapid intubation sequence and the patient^{25,26}. It is placed on the surgical bed, covering the cephalic region to reduce direct contact with aerosols emitted when breathing, coughing or speaking. Moreover, reusing the aerosol box for other procedures is possible after proper disinfection with 70% alcohol or chlorine (5000 mg/L) (Figs. 4 and 5)²⁷.

In case the box represents an obstacle to rapid sequence intubation or extubation, we suggest removing it. We recommend using a video laryngoscope to decrease the range of movements required during airway manipulation. Using this technique may involve a risk in case of not having trained personnel for this purpose. So far, there is no evidence of its effectiveness, but we consider that it is an appropriate measure for protection of the SAP COVID team.

6) Procedures with high risk of aerosol generation

Tracheostomies, endoscopies and bronchoscopies should be managed as in confirmed COVID-19 patients, maximizing the use of PPE²².

According to the guidelines of Ear, Nose and Throat surgery in the United Kingdom (ENT UK), tracheostomy is an elective procedure that entails a specific risk and, therefore, individualized management is required²⁸. So far, there are only prototype devices available, which allow maintaining a closed circuit of the airway and, in turn, introducing the endoscope²⁹.

Postoperative phase

It starts at the conclusion of the surgical procedure, but half an hour before the end of surgery, patient

- Pneumoperitoneum should be eliminated before starting closure, removing the trocars, extracting the surgical specimen, or converting to open procedure, by means of a closed elimination circuit.

3) Electrosurgery

The use of electrosurgery should be reduced. If necessary, using a smoke evacuator system and titrating the lowest levels of energy is recommended^{20,21}.

4) General vs. regional or local anesthesia

Regional or local anesthesia is recommended over general anesthesia²². In case of endotracheal intubation, rapid intubation sequences carried out by an expert are preferred²³. The use of an aerosol box for rapid-sequence intubation and extubation is recommended. Applying alcohol to the intravenous line or intravenous catheters and to tripods is suggested²⁴.

5) Aerosol box

The aerosol box is a non-airtight device, made of acrylic or polycarbonate, which acts as an additional

Table 1. COVID team entry and exit times

Member	Entry	Exit	PPE*
Orderly	In charge of transporting the patient to the transfer site	In charge of transporting the patient to the isolation area	Risk II/full PPE
Circulating nurse	Receives the patient at the transfer area and is in charge of transporting the patient to the OR	Activate patient exit code Once the patient has recovered, he/she will be in charge of delivering him/her at the transfer area	Risk III/enhanced PPE
Instrument nurse	Once the patient has undergone the anesthesiology procedure	At the end of the procedure	Risk III/enhanced PPE
Anesthesiology	Once the patient is on the surgical table	Once the patient recovers	Risk III/enhanced PPE
Surgeons	Once the patient has undergone the anesthesiology procedure	At the end of the procedure	Risk III/enhanced PPE
Cleaning staff	At the time the patient leaves	At the end of OR disinfection	Risk II/full PPE

PPE: personal protective equipment.

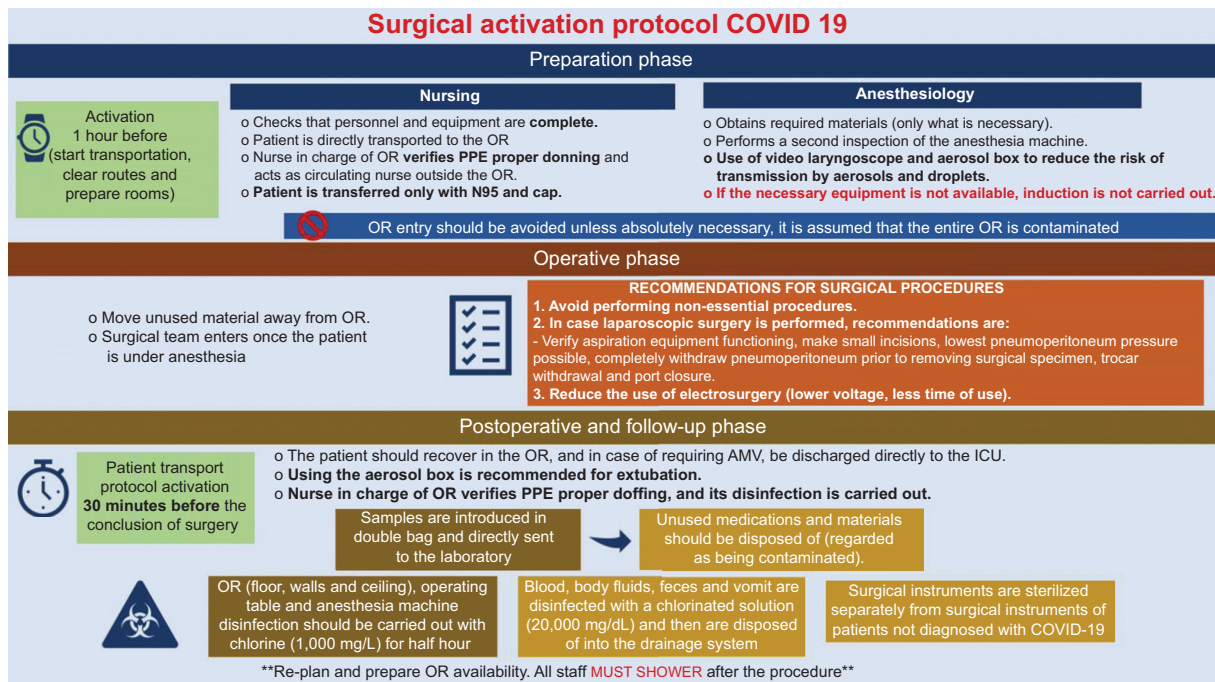
*Recommendations of the World Health Organization and the Centers for Disease Control and Prevention¹

Figure 6. Surgical activation protocol COVID-19 summary.

transport must be activated. Anesthetic recovery will take place in the OR. In case mechanical ventilation is required, the patient will be discharged directly to the ICU accompanied by the circulating nurse and the anesthesiology team¹⁹.

1) Handling of samples, blood and body fluids

Samples or surgical specimens are introduced in a double bag and sent directly to the laboratory. For the management of blood spills of less than 10 mL,

removal is carried out with towels containing a 5,000 mg/L chlorinated solution and then the surface is cleaned twice. Spills of more than 10 mL are completely covered with absorbent compresses, then soaked with a 10,000 mg/L chlorinated solution for at least 30 minutes and then removed taking care not to contaminate other surfaces.

Feces and vomit are disinfected before being discarded into the drain by placing them in a container

with a 20,000 mg/L chlorinated solution at a ratio of 1:2 (waste: disinfectant solution) for a 2-hour period³⁰.

2) Handling of surgical instruments and cleaning of the OR

Material and medications used during the procedure should be disposed of. Reusable surgical instruments and materials are disinfected with chlorinated solution (1,000 mg/L) for half an hour. Then, separately, the instruments of patients without COVID-19 diagnosis are sterilized. After the removal of visible contaminants, ceiling, walls, and floor are scrubbed with a 1,000 mg/mL chlorinated solution for at least 30 minutes, as well as the surfaces of monitors, beds and tripods. The OR should be disinfected by personnel trained in the use of PPE³⁰. Waiting at least one hour to use of the OR after finishing the procedure is required, a period of time that allows proper cleaning and preparation of the room.

3) Postoperative follow-up

Postoperative follow-up takes place in the isolation area or ICU, depending on patient respiratory condition, preferably in an isolated room and restricting access to visitors. If patient general conditions allow, any non-essential contact for postsurgical evaluation should be avoided. At discharge, consultations will be carried out by telephone or video call¹⁶. A summary of the phases is shown in figure 6.

Conclusion

Despite the adversities of this pandemic and the huge challenges faced by hospital centers, it is imperative for surgical practice to remain focused on quality of care and patient safety, as well as of that of medical personnel.

The strategies herein presented are reproducible, accessible and applicable, considering the limitations of most institutions. We are aware that these recommendations are not absolute and should be dynamically adapted as more knowledge about COVID-19 behavior is generated. We are certain that by sharing our perspective we contribute benefits to health personnel and to the management of affected patients.

Conflicts of interest

The authors certify that they are not involved in any organization with financial or non-financial interests in the subject matter discussed in the manuscript.

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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 research.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained informed consent from the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

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