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Research article

General And Regional Anesthesia In Patients With Covıd-19: A Different Idea

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ABSTRACT

Coronavirus 2 (SARS-CoV-2), which started in Wuhan, China in December 2019, was officially named Corona Virus Disease 2019 (COVID-19) by WHO (World Health Organization) on February 12, 2020, with the rapid spread of the infection to the world. With the increase in the number of cases, surgical operations in hospitals that are deemed suitable for the treatment of the disease have become risky areas in terms of transmission. In cases where elective or urgent surgery is required for these patients, there is a need for ideas that will require a new approach in addition to guides showing preoperative preparation (preoperative phase), how to proceed during perioperative care, and how to take measures to protect the surgical team and anesthesia team and other healthcare professionals.

Our aim in this study is to emphasize the importance of the fact anesthetists, surgical branches and other healthcare professionals at great risk during emergency or elective surgeries of patients infected with COVID-19 or with suspicious contacts, and to recommend a different view to the literature in terms of creating optimum protection conditions that can be done in the preoperative, peroperative and postoperative period.

Keywords: Covid-19 infection; general anesthesia; regional anesthesia; different methods

INTRODUCTION

The outbreak of coronavirus 2 (SARS-CoV-2) infection, which first appeared in the 1960s and caused severe respiratory failure, caught the attention of the whole world in December 2019 in Wuhan, Hubei Province of China. On February 12, 2020, WHO officially named the disease caused by the new Coronavirus as Coronavirus Disease 2019 (COVID-19) (1). In this process, as COVID-19 spreads in the world and in our country, hospitals deemed suitable for the treatment of this disease have become risky areas for surgical operations. It should be known that patients infected with COVID-19 may have unnoticed symptoms during preoperative and peroperative evaluation as an anesthetic. In addition, it should be kept in mind that the main symptoms are fever, dry cough and dyspnea in a significant number of patients (2,3). Most patients have comorbid diseases such as long-term diabetes, hypertension, cardiovascular and pulmonary disease (3). These comorbidities should be questioned preoperatively, as they will increase perioperative complications. During the preoperative laboratory evaluation, attention should be paid to especially frequent leukopenia and lymphopenia. In addition, it should be kept in mind that there may be abnormal liver function test findings such as increased alanine aminotransferase (ALT), aspartate aminotransferase (AST), creatinine kinase (CK) or lactate dehydrogenase (LDH) (4,5). Coagulation parameters, D-Dimer, ferritin level and fibrinogen levels are among the important examinations to be cared. These values will be effective in determining the type of anesthesia to be applied.

Intensive care and anesthesiology teams should be prepared for the treatment and continuous care of infected patients in this disease, in which the number of cases is increasing day by day (6). In cases requiring elective or emergency surgery, there is a need for ideas that will require a new approach, as well as guidelines showing how to take precautions to protect the patient, the surgical team, the anesthesia team and other healthcare professionals, how to follow the pre-operative preparation (preoperative phase), and perioperative care.

Exposure to the disease and the risk of getting sick increase in healthcare professionals during the treatment of this disease. In addition, as a result of this situation, the risk of healthy

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manpower decreasing in the fight against the epidemic brings to the agenda. On the other hand, the possibility of asymptomatic or mildly symptomatic patients to contact healthcare workers more easily multiplies the risk of both the spread of the disease and the risk for the healthcare professionals. It is stated that the new Coronavirus pneumonia can be transmitted from person to person and can cause hospital infection that seriously threatens surgical personnel, surgical team and inpatients (7).

We have observed that patients with proven or suspected COVID 19 infection need a special procedure from admission to discharge, and therefore we believe that they should be evaluated in three sub-sections: preoperative evaluation, perioperative and postoperative phases. For this reason, it is important to talk about new innovative methods about how to protect health professionals from coronavirus during these periods.

Our aim in this study is to propose a different perspective to the literature regarding the fact that anesthetists, surgical branches and other healthcare professionals are at great risk during emergency or elective surgeries of patients infected or suspected with COVID-19, and in terms of creating optimum protection conditions that can be done in the preoperative, peroperative and postoperative period.

General precautions and rules

The approach to be considered here will apply to COVID-19 positive (Type 1), COVID-19 highly suspected (Type 2) and asymptomatic patients with usual suspicion (Type 3). The pre-operative period, whether it is an emergency or an elective patient, should be made according to the patient welcome protocols prepared for the peroperative management of COVID-19 patients in the hospital you are working in. In the preliminary evaluation, before contacting the patient, the patient's previous history and, if any, previous examinations should be examined through the hospital automation. Afterwards, examination preparation should be made according to the patient's additional disease and the severity of the disease. This preparation requires the examiner to use Personal Protective Equipment (PPE). As suggested by Gattinoni et al. (8), the most important and unforgettable step of this process is to protect the healthcare worker, and the examination and other procedures are completed by using overalls, bonnets, masks, goggles or face shields, gloves. The use of PPE should be done in accordance with the instructions set out by the manuals. After the examination of the patients is completed in the preoperative period, there is no need to wait until the test result is obtained in patients with suspected COVID-19 diagnosis. It is stated that it is appropriate to be taken into operation, considering it as COVID-19 positive.

Preoperative Evaluation

A case diagnosed with or suspected of having COVID-19 may have been admitted to the surgical service from the outpatient clinic or emergency room following normal procedures. In both cases, preoperative evaluation of such patients should be done in a protected area predetermined according to the hospital's COVID-19 patient approach protocols. Although all cases are considered positive and the procedure is recommended, it is important for anesthesiologists to evaluate suspicious cases and diagnosed cases in two separate groups in cases requiring emergency surgery. Because although the protective measures to be taken during the evaluation are similar, treatment options may change.

In the first evaluation of the patient; Before contacting the patient, pre-recorded medical history from the hospital automation, existing tests in the system, PA chest radiographs, and tomography should be evaluated. Reviewing the case with other physicians, obtaining information from the family about other aspects that are not reflected in the medical history, and recording all this information will contribute to the process management. Anamnesis of the intubated patient is taken from his family. His general condition is evaluated at the bedside. The anamnesis of the patients who have a good spontaneous breathing and a cooperative-oriented clinical condition are taken from them.

The awake, cooperative patient may not know who you are due to the PPE being worn. Therefore, it is recommended to introduce yourself. Anamnesis should be completed in the optimum time, considering the virus load of the environment. Possible equipment that may be required during the examination should be available in advance (additional sterile gloves, abeslang, light source, stethoscope, etc.). When the preoperative evaluation is completed, it is applied to the patient in consultation with other doctors involved in the case, and the anesthesia and surgery protocol is determined and the procedures to be performed are notified to the family by telephone. The aim is to minimize the risk of contamination as much as possible.

It should be kept in mind that if the lung infection of COVID-19 infected patients who need to be taken into emergency surgery is advanced, the possibility of intubation will increase and the mortality risk of these patients will be very high because of the high mortality of the intubated patients worldwide. For this, if the patient is a cooperative, information should be given to himself, if not, to his family (8). Every action taken should be regularly recorded in the automation database and recorded. However, signed approval may not be obtained from the patient due to the high risk of infection, respiratory distress or intubation. In this case, it may be appropriate to obtain informed consent from the family.

Preparation of Preoperative Operating Room Conditions

Pre-Operating Room Precautions

It should be ensured that the entire route from the service / patient bed or intensive care unit (ICU) to the operating room, including the hospital elevators, is suitable for transfer for the patient and the transferring health personnel. The patient carrier staff and the nurse or anesthesia technician who will deliver the patient must wear PPE and be ready according to the rules.

Precautions and preparation in the operating room

The operating theater should be designated as a specific room of the operating room, if possible, and should be a room equipped with negative pressure if possible. However, this may not seem possible in most hospitals.

Then positive pressure operating theaters can also be determined and used. During the epidemic, the same operating room and the same anesthesia machine will be suitable only for COVID-19 positive and highly suspicious cases. Placing an additional bacteria-virus filter at the expiration outlet of the circuit will greatly minimize virus infection of the device. Both this filter and soda-lime should be changed after each surgery.

The circuit must be used for single use and disposed of. The exhaust air system must be inspected for leaks. In addition, approaches to minimize contamination of the operation room should be implemented. In the process of COVID-19, many innovative approaches have been brought to the literature for this purpose.

For this purpose, we have developed new concepts by focusing on new solutions in our clinic. As one of these approaches, we developed the Aerosol Box system that we will use in the intubation process.

The aerosol baxes we designed consist of two models. The most basic feature of the aerosol caps we have designed is that a valve system or a fixed glove system is attached to the area where the hand is entered, which prevents air from being released after the hand is removed.

Model-1 is designed for our standard patients, and the caudal part of the patient, in the form of a rail system, is made of rubber material that will minimize air leakage.

It also has an aspirator inlet to aspirate the virus-laden air inside and a bacteria virus filter system attached to this aspirator system. Model-2 is the head and neck aerosol bax designed for obese patients.

This Aerosol bax is likewise connected to the aspirator system (Figure 1-2).

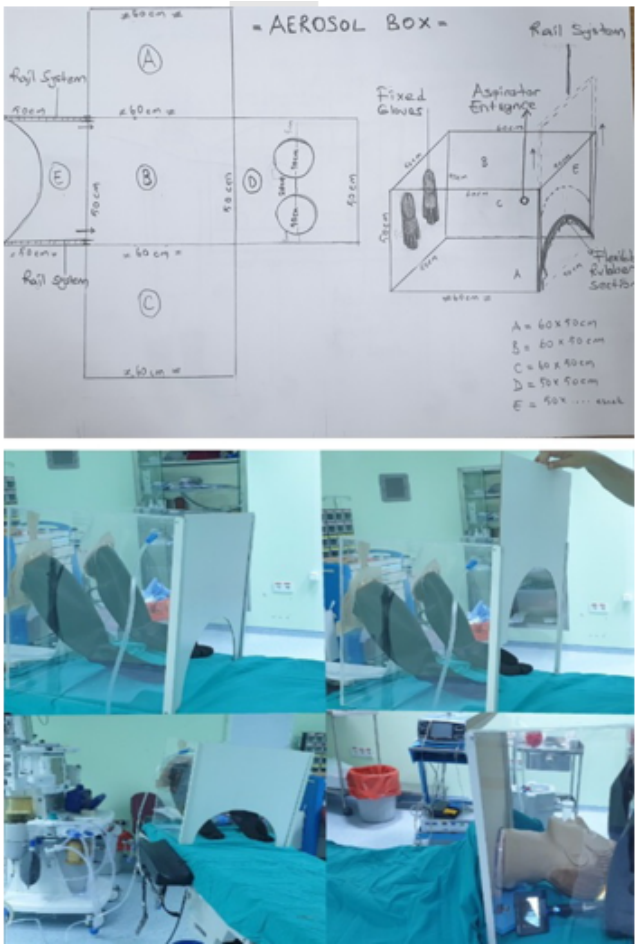

Figure1: Model-1 Aerosol Bax structure

If possible, we recommend the use of disposable video-laryngoscopy, which has the highest chance of success with a single application, in order to avoid repeated instrumentation of the airway against the risk of increasing the risk of contamination by the operator and those in the environment as a result of increased aerosalization with repeated entries. Non-disposable videoingoscopy equipment should be thoroughly cleaned and sterilized after use.

In order to prevent contamination from patients, all personnel working in the relevant operating room must first wear PPE and wear standard surgical gowns on it. Personal protective equipment; All interventional procedures such as intubation, regional anesthesia, cannulation, catheterization and surgical intervention should also be worn.

As PPE Equipment

- Waterproof overalls, surgical gowns.
- Mask: Traditional surgical mask does not provide protection if there are aerosols. N95 or FFP2 / FFP3 type masks are required (with valve if possible).
- Glasses or face protection transparent barrier (screen). However, if aerosols are likely to splash during the procedure, full-screen eye coverage is required. If not, a partial screen may be enough just to avoid splashing or direct contamination.
- Surgical (latex or non-latex) gloves.

- It is recommended that all personnel with long hair gather their hair under the bonnet and if there is a beard, the beard should be trimmed so that the masks fit comfortably.
- Shoes must be without holes and cover the entire foot. If possible, sterilizable rubber boots or disposable boot overshoes should be worn.
- After these preparations, if neuraxial or peripheral block is to be applied, standard sterile surgical gowns should be worn. Before wearing surgical gloves, lower gloves should be washed with virucidal agents or alcohol.
- In case of overshoes on hands and feet, it is necessary to fix them with adhesive tapes against the risk of contamination(Figure 3).

Figure2: Model-2 Structure of Head-Neck Aerosol Bax

The anesthesia drug cart should be kept in the induction room. Before starting each operation, the anesthesiologist should place all medications and equipment required during the procedure into the medication cart to avoid contamination during the procedure. However, if additional medications are needed, hand hygiene and glove change should be done before entering the induction room and using the medicine cart.

Transfer from intensive care and ward / patient bed to the operating theater

The patient is sent to the operating room by medical staff wearing PPE, according to the patient's Type 1: Covid-19 positive, Type 2: highly suspicious or Type 3: usual suspect (asymptomatic), respectively transport ventilator, medical protective mask (n95, Ffp 2, Ffp 3) or transferred with a surgical mask. We think that it is appropriate to transport certain COVID-19 positive patients with Transport Ventilator. We think this method will minimize virus spread. We assume that we will achieve this with the bacteria-virus filter placed at the expiratory air outlet (Figure 4).

A: PPE, **B:** Process preparation

Figure3: PPE worn ready case

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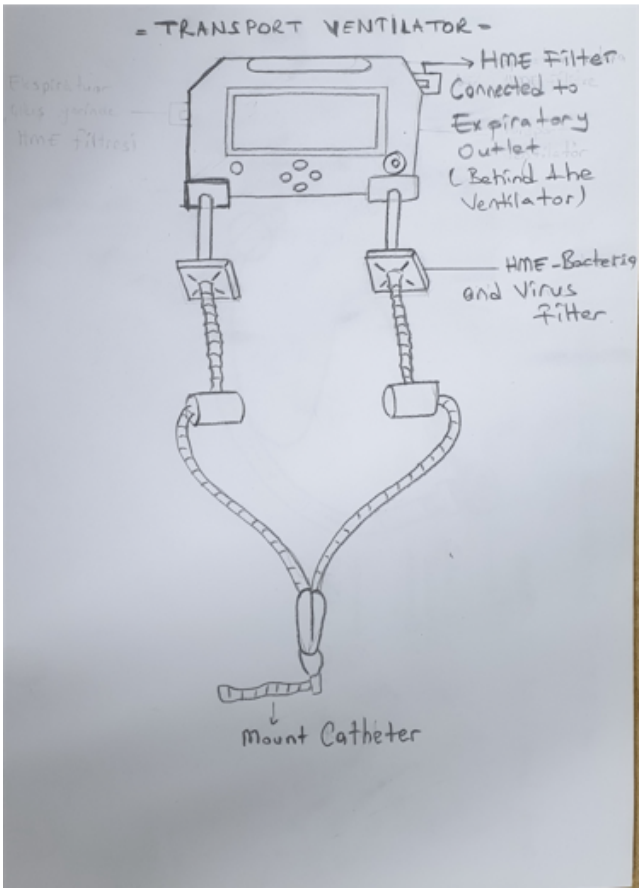

Figure4: Transport ventilator model

The CPAP mask placed on the face of the patient will prevent aerosolization and ultimately the environment infection. In addition, this will be fully minimized with a bacteria-virus filter in the expiratory waste gas outlet. For intubated patients in the intensive care or emergency room, with an appropriate ventilator mode tailored to the patient, transport is done by a ventilator in the presence of a healthcare professional wearing a fully PPE. Extubated spontaneously breathing COVID-19 positive patients are transferred from the clinic to the ambiance with a cpap that fits perfectly on their face, accompanied by a PS / CPAP-like mode. The aim here is to bring the patient to the operating room with a ventilation close to spontaneous mode with low pressure, while we believe that the environment will be infected as little as possible by leakage aerosolization. In case of patient transfer with mask or nasal oxygen, we recommend the use of a transport ventilator that will minimize this because the risk of infection in the environment will increase significantly in the case of excessive aerosolization from the mask to the outside with the positive pressure created during cough and sneezing. During the replacement of the ventilator of the intubated patient, the endotracheal tube should be clamped with forceps, a specially developed plastic clamp or a bacteria-virus filter (Figure 5).

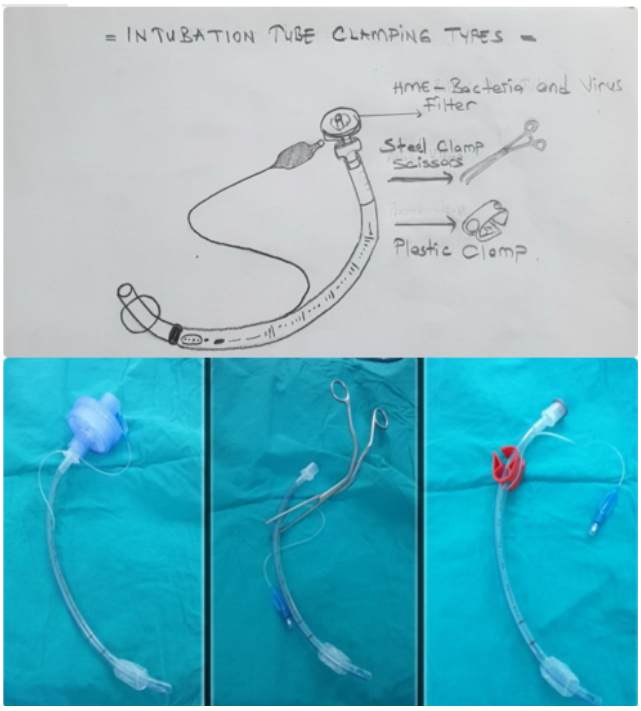

Figure5: Intubation tube closure methods

It can be transferred with Cpap mask with Transport Ventilator or Medical mask to prevent aerosolization to the environment in suspected patients. Ordinary suspected patients can be transferred with either a medical mask or a surgical mask (Figure 6,7).

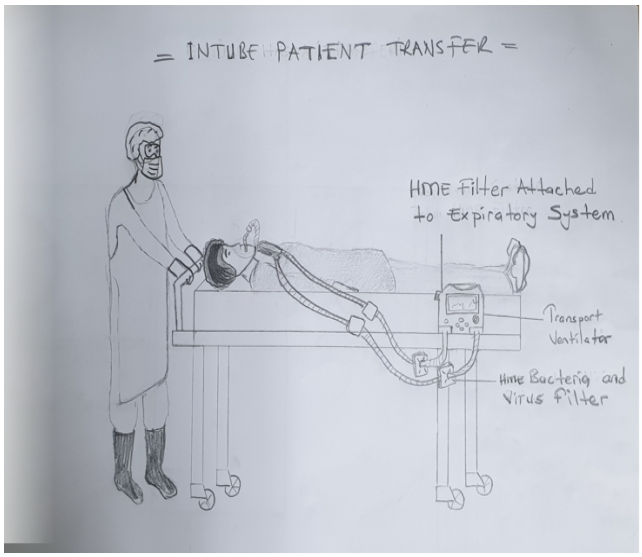

Figure6: Transfer of patient to intubated with transport ventilator

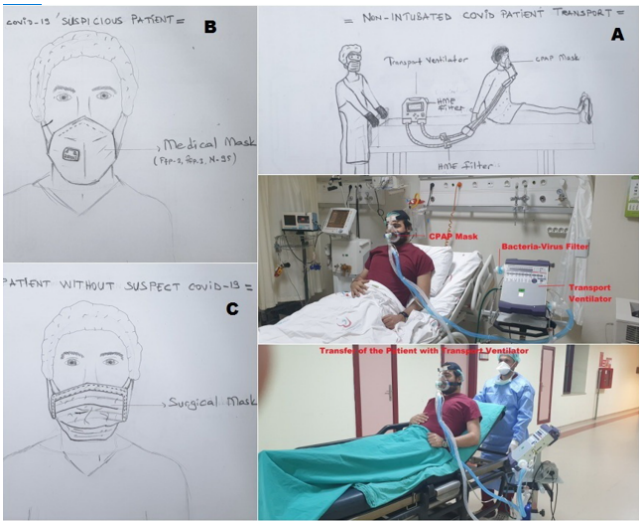

Figure7: Transport alternatives of the extubated patient **A: Type 1:** Covid-19 positive or **Type 2:** Highly Suspected Patient **B: Type 2:** Highly Suspected Patient **C: Type 3:** Ordinary Suspect (asymptomatic patient)

Peroperative Period

When the intubated patient arrives in the operating room, the endotracheal tube is alternately closed with forceps, a specially developed plastic clamp or a bacteria-virus filter when changing the ventilators.

In order to prevent aerosolization of spontaneously breathing COVID-19 positive (type 1) patients to the external environment, the patient who comes with a cpap mask with a Transport ventilator should be placed on the patient before induction with a Model 1 or Model 2 aerosol box designed according to the patient's weight. The remaining spaces should be covered with sterile covers to prevent air leakage. Especially in order to prevent aerosolization of the virus-loaded patient exhalation air in Aeoresol Bax to the environment, our system is prepared by attaching a Bacteria-Virus Filter to the central system of an aspirator tip connected to Aeoresol Bax before aspiration.

After all intubation tools and equipment are prepared, induction should be provided without removing the mask. Meanwhile, the patient whose spontaneous respiration will be lost should be changed to a fixed-frequency mode by changing the transport ventilator mode. Then, rapid intubation should be performed through the aerosol box with a video-laryngoscope, a bacteria-virus filter should be placed over the intubation tube to prevent air leakage, or it should be clamped with a steel clamp and / or plastic clamp.

As soon as the patient is intubated, the intubation tube cuff should be inflated immediately after the aerosol box is taken from the patient and the clamps should be opened after the connection to the mechanical ventilator. If there is no problem with the patient's ventilation, the bacteria-virus filter does not need to be removed(Figure 8).

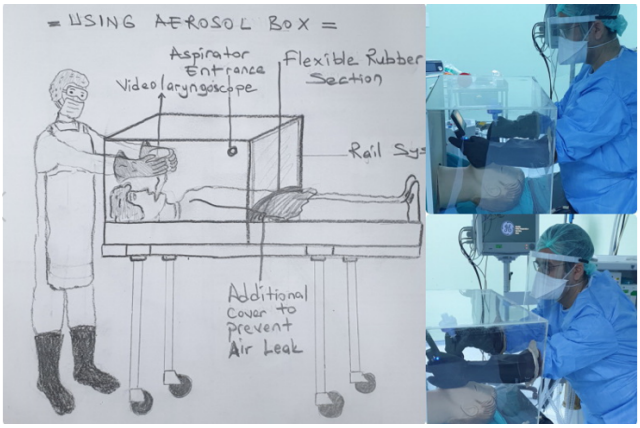

Figure8: Method of use in intubation

We recommend that patients with spontaneously breathing COVID-19 positive (type 1) who will be applied neuraxial block (Spinal-Epidural) or peripheral nerve block remain attached until the end of the procedure without removing the transport ventilator connections during the procedure. During the procedure, maximum attention should be paid to prevent the wearing of the mask during every position to be given to the patient. Although the transport ventilator will be sedated, it should be kept in mind that it will provide support like a reservoir oxygen source (Figure 9).

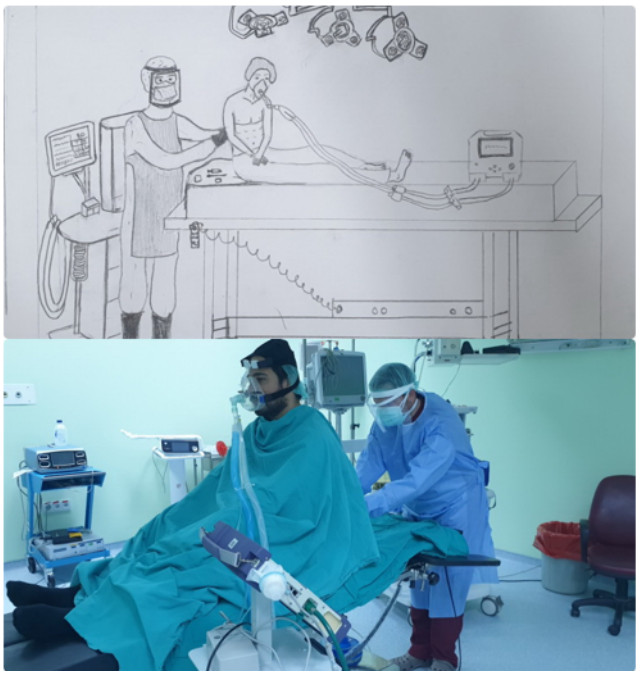

Figure9: Neuroaxial block demonstration with transport ventilator accompaniment

If general anesthesia is to be applied to patients with high suspicion of covid (type 2) or usual suspicion (type 3), the same aerosol box procedures described above are applied.It is sufficient to have a medical mask or surgical mask on their faces while regional anesthesia is performed for this patient group (type 2, type 3). Mask oxygen or nasal oxygen should be avoided to abstain from aerosol distribution as much as possible. Preferably, low dose sedation is sufficient. Immediate perop after regional or neuraxial anesthesia in type 2 and type 3 patients. In

emergency situations (in case of decrease or loss of spontaneous breathing effort or in situations where oxygen is needed such as level increase), the patient should be followed up in an assisted mode with a CPAP scissors and mechanical ventilation.

During these procedures, an operating room technician should wait outside the operating room, considering that additional medications or equipment may be required. In addition, these personnel assistance is needed to send samples such as arterial blood gas samples or frozen studies. Operating room technicians must wear PPE when entering the operating theater. If he will not enter the hall, it will be sufficient to wear a mask.

Postoperative Phase

It should be ensured that patients who are intubated from the intensive care unit are sent back with the same procedures during their arrival. If the intubated patient is to be extubated, it will be appropriate to use fast muscle relaxant rotators such as sugamadex, which will ensure rapid recovery of muscle function, if possible, in order to prevent the patient from infecting the room. Again at this stage, a bacteria-virus filter should be attached to the intubation tube of the patient whose spontaneous breathing returns, and as soon as the patient is extubated, a transport ventilator cpap mask should be placed and the patient should be ventilated in this way. We recommend that these patients who do not require ICU care are fully recovered in the operating room and transferred to the clinic with a transport ventilator or medical mask to prevent aerosol distribution during transport.

Patients who have had regional anesthesia should be transferred with a CPAP mask if they are followed up with a CPAP mask, and if they have been followed with a medical mask or surgical mask, they should be transferred with it.

It is necessary to plan between cases to clean all surfaces, screens, keyboards, cables, monitors and anesthesia machine that are contaminated after the operating room personnel return the patient to the service. Products not used in surgery should be considered infected. In addition, all personnel should remove the PPEs under appropriate conditions recommended by the ministry and prepare for other surgeries without continuing their duties.

Patients should be followed up and treated in isolated intensive care units or in isolated rooms in accordance with hospital protocols after the operating room. While caring for the patient, the basic rules mentioned above should be followed. (Table 1)

Table1: Summary

Viral Transmission Risk Patient Group
-Type 1: Covid-19 PCR test Positive Definite Diagnosis
-Type 2: Highly Suspected patient with Covid-19 contact suspicion, symptoms and CT findings
-Type 3: Covid-19 unsuspected asymptomatic patient
Preparation for Surgery:
- Communication with service, emergency room, operating room, anesthesia, intensive care team
- Setting up a room for this in the operating room
- Disposable circuitry should be used whenever possible. Sodalime should be changed daily.
- Aerosol box system should be prepared. Video laryngoscope (single use if possible) should be prepared
-The anesthetic medicine cart should be kept in the induction room
- Before starting each operation, the anesthesiologist should place all medications and equipment required during the procedure in a tray to prevent the drug cart from being used during surgery.
- All materials for intubation must be ready (clamps and HME filter)
- If a neuraxial block (spinal-epidural) or peripheral nerve block is to be performed, the materials should be available.
- Use of Transport Ventilator in the operating room for patients who are or are likely to need postoperative intensive care
- Elective surgeries should be performed during the day as much as possible, and night costs should be reduced as much as possible
- Coordination should be made with the operating room team regarding the location and quantity of PPE equipment.
During the Operation:
-Only the necessary number of personnel should be in the operating room.
-A second technician should be found outside the operating room for the necessary needs.
- Telephone and pagers must be outside the operating room
Personal Protective Equipment:
- Personal protective equipment; All interventional procedures such as intubation, regional anesthesia, cannulation, catheterization and surgical intervention should also be performed compulsorily.
- In the PPE; Waterproof overall and apron, cap, mask: Traditional surgical mask does not provide protection if there are aerosols. N95 or FFP2 / FFP3 type masks, goggles or face protection transparent barrier (screen), latex gloves, sterilizable rubber boots or disposable boot overshoes should be found.

CONCLUSION

In conclusion, we found it appropriate to contribute to this pandemic period in which the world and our country went through difficult times and to make an innovative contribution to the examples that will shed light on new studies.

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