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Editorial

Anesthetic management of patients with COVID-19

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Nowadays, we have to face an unexampled outbreak associated with more than 1 million over the world and with quite high mortality. Health systems are solely focused on this pandemic, which is globally out of control. Although the majority recovers with mild to moderate symptoms, pneumonia may ensue with respiratory failure. Healthcare providers and especially anesthesiologists constitute the frontline of this outbreak. It is actually very dynamic period with more questions than responses despite several publications worldwide. Meanwhile ultra-high spread and transmission ways are mostly determined. This article is a modest introduction about COVID-19, focusing mainly on precautions, which should be adopted by medical staff most vulnerable to this infection.

A novel pneumonia was initially described in December 2019 at Wuhan, and China reported World Health Organization (WHO) country office about unknown pneumonia. It would be later attributed to a novel coronavirus. The disease was subsequently named as "coronavirus disease 2019" or as commonly called COVID-19. On the last days of January, the first cases of COVID-19 were enrolled in Italy, and a terrifying cluster ensued in Lombardy. Outbreak gained a global aspect with new cases in Europe and in Asia.

At first days of February, China reported more than 20.000 patients. Owing to the rapid spread of the disease, WHO proclaimed pandemic on 10 March with a situation report. Organization Director highlighted the importance of readiness, detecting modalities, protection and reducing transmission in his global message. Furthermore, COVID-19 reached America with the United States, Canada, Brazil, Chile as well as Australia and New Zealand. The first case was declared on 11 March in Turkey. Actually more than 200 countries are involved about 1.2 million patients and more than 60.000 deaths (in the first days of April).

The pathogen belongs to the Betacoronavirus family existing about 5000 years on earth and known to be associated with severe acute respiratory syndrome (SARS) or Middle East respiratory syndrome (MERS) [1]. The name is related to the crown-like view of S proteins under electron microscopy. It is an enveloped RNA virus, which seems to use angiotensin converting enzyme 2 receptor via S protein similar to SARS. These receptors are situated particularly in the lung but also in intestines, myocardium or vessels.

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Animal species might be considered as a host of coronavirus. However, human-to-human transmission is achieved mainly by respiratory droplets. Oral- fecal transmission is conceivable as the virus can replicate in the gastrointestinal system [2]. Symptomatology of coronavirus family can be explained by the structural differences of their proteins, tropism or replication procedures. When it enters the target cell, RNA replication succeeds while shielding from host defense.

The reproductive number (R0) which means the expected numbers of patients by an initial infected person, is 2-2.5 [3,4]. Initial data reported that infected individuals double every 7.4 days [5]. The incubation period is generally 4 to 7 days (2-14 more exactly). It can be affected by host characteristics, or by the phase of the epidemic [6].

Reverse transcriptase polymerase chain reaction is the standard testing method. Throat or nasal swabs are used for diagnosis with an initial positive rate of 30-60%. This limitation could be ameliorated with serial sampling.

The clinical course of COVID-19 represents a large spectrum from mild to severe either fulminant form. Fever and dry cough are the commonest symptoms of about 85-90% [6,7]. Other non-specific signs are myalgia, fatigue, headache, diarrhea, etc. Asymptomatic infected individuals have a key role in transmission.

Subjects with mild clinical course have generally good prognosis. About 15 to 20% of infected patients would have pneumonia. Shortness of breath can warn about a serious outcome. Radiographic findings are well established with the bilateral and peripheral location as ground glass opacities. Radiologic patterns may become "crazy- paving" with the progression of the disease. Leukopenia and especially lymphopenia are frequent. Lower antithrombin, and higher D-dimer values are other hematologic changes and associated with severe disease [8].

Clinical features and therapy of pneumonia is a hot topic, which needs to be updated too often and should be largely interpreted in another article.

The main transmission mechanism is via droplets or airborne, healthcare providers working in a milieu open to patients' respiratory secretions are at increased risk of infection. The next part of this article would focus on high-risk procedures and personal precautions necessary for staff.

High-risk procedures to generate aerosol are mainly defined as tracheal intubation or surgical airway, bag mask ventilation, non- invasive ventilation procedures (CPAP, high flow) and bronchoscopy [9]. Cardiopulmonary resuscitation, circuit disconnection, and tracheal extubation are similarly associated with a high risk of aerosol generation. General precautions are aimed to define explicitly airway strategies, to prepare and to utilize guidelines, to isolate high risk areas for aerosol generating medical procedures (AGMP) -create hot, warm and cold zones- and to limit staff during these procedures. It is also crucial to educate all staff -not only medical ones- for transmission ways, institutional logistic decisions and safety measures. At last but not least, surgery is feasible only if it becomes lifesaving.

Operating room (OR) dedicated to COVID-19 patients should rather have a negative pressure system with adequate pressure levels. Organization for OR includes the distinction of dirty, clean buffer or clean zones. The dirty zone is accessible for two anesthesiologists, surgeon, and assistant(s), nurse(s). They have to be armed with full protection including goggles (or face shielding), appropriate masks (N95/ FFP 2 and FFP 3), fluid resistant gown and double gloves [9-13]. Hand washing or the use of quick disinfectants are suitable for each step [11]. A 'buddy system' to ensure correct preparation in clean the buffer zone is recommended [10]. Assistants for anesthesia and surgical teams wait and help in the clean buffer zone, they are equipped with standard masks and scrubs. It is essential to remind that no staff should enter or exit until the case ending. It could be allowed unless adequate precautions are established. Anesthetic and surgical runners are located in the clean zone.

Spinal anesthesia in COVID-19 constitutes an alternative for limited procedures (Caesarean section or lower-limb surgery) [14]. Otherwise, endotracheal intubation is mandatory omitting facemask or supraglottic airways. During the endotracheal intubation period, limiting staff -with two anesthesiologists- is preferred to minimize viral exposure. Pre-oxygenation with 100% for 5 minutes is suitable for prolonged apnea period.

The patient's mouth and nose should be shielded by two layers of wet gauze or transparent covers to minimize droplet dispersion. Rapid sequence induction is largely recommended [10-14]. Rocuronium (1-1.2 mg.kg-1) is the first alternative for neuromuscular blocking, suxamethonium could be used with a dose of 1.5 mg.kg-1 considering apnea time and risk of coughing [10]. Video-laryngoscopy is vital to protect anesthesiologist with a safer distance of infected patient's airway. An experienced anesthesiologist assumes for smooth intubation and the second one should immediately inflate tube balloon. A clamp to the endotracheal tube (ETT) or exhalation filter should be prepared before intubation. Confirmation of ETT has easily achieved with end-tidal CO2 tracing. An epidural filter can be used in streamline end-tidal CO2 sampling lines. Leakage should be monitored and avoided. All airway equipment should be available in dirty or clean buffer zones according to difficult airway predictions. If difficult airway is suspected, anesthesiologists should consider guideline recommendations, their resources and patient's status. Awake intubation is possible within experienced teams but potentially associated with increased aerosol generation. Insertion of the supraglottic airway with subsequent ETT placement can be another alternative [10].

It would be clever to use COVID-19 dedicated anesthesia machines with high efficiency filters on both inspiratory and expiratory limbs. Two HME filters could be placed next to ETT. If surgery lasts more than 4 hours, filters should be changed. Anesthesia machine, monitors, pumps should all covered by packs with the availability of control panel. Carbon dioxide absorbent should be replaced at the end of cases.

Tracheal extubation is an AGMP as well. Coverage or wet gauze layers should be placed. Recovery should be as smooth as possible to prevent coughing and secretions. One of the filters is removed with ETT, and the second is immediately joined to face mask. When adequate spontaneous ventilation is established, the patient can be transferred from OR to ward with a face mask and O2 supply if necessary. If the postoperative course requires a planned ICU stay, then a team with personal precautions would transport following dirty zone instructions. Removal of protective equipment begins in the clean buffer zone from goggles to gown, protective mask and head cover with handwashing in each step.

In conclusion, this global outbreak represents a big problem for health care systems. Medical staff should aware of the mode of transmission, protective measures and thereby execute appropriate changes in hospitals. Appropriate preparation, meticulous control, strict submission to precautions are essential for the health and safety of frontline workers as anesthesiologists.

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Ethical Statement

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