

NARRATIVE REVIEW

Recommendations for local-regional anesthesia during the COVID-19 pandemic



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Abstract Since the beginning of the COVID-19 pandemic, many questions have come up regarding safe anesthesia management of patients with the disease. Regional anesthesia, whether peripheral nerve or neuraxial, is a safe alternative for managing patients with COVID-19, by choosing modalities that mitigate pulmonary function involvement. Adopting regional anesthesia mitigates adverse effects in the post-operative period and provides safety to patients and teams, as long as there is compliance with individual protection and interpersonal transmission care measures. Respecting contra-indications and judicious use of safety techniques and norms are essential. The present manuscript aims to review the evidence available on regional anesthesia for patients with COVID-19 and offer practical recommendations for safe and efficient performance.

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PALAVRAS-CHAVE
 COVID-19;
 Anestesia regional;
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 Raquianestesia

Recomendações para realização de anestesia loco-regional durante a pandemia de COVID-19

Resumo Desde o início da pandemia de COVID-19, muitas questões surgiram referentes à segurança do manejo anestésico de pacientes acometidos pela doença. A anestesia regional, seja esta periférica ou neuroaxial, é alternativa segura no manejo do paciente COVID-19, desde que o emprego de modalidades que minimizam o comprometimento da função pulmonar seja escolhido. A adoção desta técnica anestésica minimiza os efeitos adversos no pós-operatório e oferece segurança para o paciente e equipe, desde que sejam respeitados os cuidados com proteção individual e de contágio interpessoal. Respeito às contraindicações e emprego criterioso das técnicas e normas de segurança são fundamentais. Este manuscrito tem por objetivo revisar as evidências disponíveis sobre anestesia regional em pacientes com COVID-19 e oferecer recomendações práticas para sua realização segura e eficiente.

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Introduction

The COVID-19 pandemic exposes the entire medical team and, mainly, anesthesiologists, to a major risk of infection. As we are dealing with a potentially high severity disease, especially to the population at risk, due to the high risk of infection and transmission to others during its asymptomatic period, adoption of preventive measures is required.

Pathophysiological changes and the drugs used for treatment of the disease interact with anesthetics and anesthetic techniques, leading to unfavorable outcomes.

The American Society of Regional Anesthesia – ASRA,¹ the European Society of Regional Anesthesia and Pain Medicine – ESRA² and the European Society of Anesthesiology – ESA³ published guidance on employing regional anesthesia for patients with COVID-19. The Latin American Society of Regional Anesthesia – LASRA (chapter Brazil) and the Brazilian Society of Anesthesiology – BSA, carried out a joint review on the guidance to provide practical recommendations to anesthesiologists on safe patient management (Fig. 1). It is important to underscore that, in face of the high incidence of asymptomatic disease carriers, recommendations should also be considered for suspected cases of disease.

Why regional anesthesia?

General anesthesia requires approaching airways, a scenario with a major risk of the disease infecting the medical team, mainly anesthesiologists, due to the production of aerosols.^{4,5} Aerosol-generation mitigating techniques, such as rapid sequence induction,⁶ entail higher risk of injury, intubation failure and need for desaturation mask-balloon ventilation. The risk of transmission of acute respiratory infection to health professionals during tracheal intubation is 6.6 times higher in the group exposed to the technique.²

General anesthesia does not provide postoperative analgesia, requiring different analgesics to control pain, such as opioids, anti-inflammatory and adjuvant (clonidine, dexmedetomidine, ketamine, magnesium sulphate, lidocaine) drugs. Such medication can interact with the

different therapeutic measures currently used for treating COVID-19 and produce side effects that add to pathophysiological changes, with potential adverse effects.

Nausea and vomiting (PONV) are frequent after general anesthesia, enhancing the risk of infection to health professionals and of patient discomfort. Medication for PONV treatment and prophylaxis may present adverse effects on patients with COVID-19. Regional anesthesia attains analgesia over a prolonged period, frequently 24 hours or more, decreasing consumption of analgesics and potentially reducing the incidence of PONV.

To date, there is no evidence in the literature showing that regional anesthesia worsens COVID-19 presentation or that it presents specific adverse events in patients with the disease. Evidence suggests that regional anesthesia, including neuraxial blocks,^{7,8} is safe. There is, however, evidence suggesting higher incidence of hypotension after neuraxial blocks,⁹ as we will further discuss in the present article. In this way, regional anesthesia becomes an interesting alternative for patients with COVID-19.^{10–12}

Pre-anesthesia assessment

Suggestive signs and symptoms of COVID-19, that include dyspnea, fatigue, fever, dry cough and headache, should be recorded, because they allow screening for suspected cases and immediate adoption of protective measures. For confirmed cases, records should be clear and easy to see.

Patients' clinical status in regard to the infection should be recorded on the patient record, as for example, confirmed case, suspected case (including contact with confirmed and suspected cases), and non-suspected COVID-19 case.¹³ Diagnostic test results should be recorded.

Negative tests, mainly in the initial days of disease, do not rule out diagnosis of COVID-19. In case of uncertainty, a patient should be considered as positive until test results that rule out infection are available.

Pre-anesthesia assessment should include all medications that a patient diagnosed with COVID-19 is taking, given they may cause adverse effects. Hydroxychloroquine, for example, can increase the QT interval, having therefore,

Regional anesthesia recommendations for COVID-19: neuraxial anesthesia and peripheral nerve blocks ^{1,2,12,22,26}

For suspected or confirmed COVID-19 patients, Regional Anesthesia is preferred over General Anesthesia as an effort to decrease the number of procedures that produce aerosols

USE SAFE PRACTICES

- ✓ Appropriately don PPE before performing the procedure, taking extra time for donning PPE with the supervision of an observer.
- ✓ Regional Anesthesia is considered a non-aerosol-generating procedure:
 - Wearing a respirator mask (N95) is generally not required for performing regional anesthesia, but may be required if contact with patient lasts a prolonged period.
 - Wear a respirator mask (N95) when available, for surgical procedures with high risk of general anesthesia conversion.
- ✓ All patients should be wearing a surgical mask to decrease the spread of droplets.
- ✓ Be sure to protect the ultrasound equipment (US) with a plastic cover.
- ✓ Keep only the equipment and drugs required for performing regional anesthesia inside the OR.

CHOOSE THE TECHNIQUE CORRECTLY

- ✓ Regional anesthesia is not contra-indicated for COVID-19 positive patients.
- ✓ Prepare required drugs and put them in a dedicated plastic bag.
- ✓ Use less-impacting respiratory function blocks, such as axillar block or infra-clavicular brachial plexus block.
- ✓ Risks and benefits should be assessed before using adjuvants and continuous perineural catheters.
- ✓ Currently, there is no recommendation to adjust the doses of regional anesthesia techniques.
- ✓ Use US-guided peripheral nerve blocks.
- ✓ The most experienced anesthesiologist should perform regional anesthesia

BE VIGILANT

- ✓ Regional Anesthesia should be carefully tested before starting surgery to minimize need to convert to general anesthesia.
- ✓ Use the lowest oxygen supplement flow required to keep O₂ saturation.
- ✓ Check for/ rule out thrombocytopenia before neuraxial anesthesia.
- ✓ Be alert and ready for hypotension after neuraxial anesthesia.
- ✓ Whenever possible, postpone epidural blood patch until recovery from acute infection.
- ✓ After use, the US device must be disinfected.
- ✓ Patient post-anesthesia recovery should be performed on the same site where procedure was performed.
- ✓ Be ready for possible block failure and local anesthetic systemic toxic reactions.

LASRA LATIN AMERICAN SOCIETY OF REGIONAL ANESTHESIA
SBA SOCIEDADE BRASILEIRA DE ANESTESIOLOGIA
Adapted from the ASRA ESRA Guideline

Figure 1 Guidance on employing regional anesthesia for patients with COVID-19.

the potential of causing severe arrhythmias and even, cardiorespiratory arrest, mainly in patients that are on other medications with the same adverse effect. Therefore, all medications patients are on should be recorded.

COVID-19 causes acute respiratory failure, with a major change in the ventilation-perfusion ratio¹⁴ and pulmonary shunt, leading to hemoglobin desaturation and retention of CO₂. Appropriate assessment of respiratory function should include respiratory rate and hemoglobin saturation count, and signs and symptoms of respiratory discomfort or failure.

Hypotension and hemodynamic instability can occur in patients with COVID-19. Acknowledging medication taken is extremely important, because its addition to some of

the current treatments can cause heart abnormalities, such as arrhythmias. Cardiocirculatory system assessment should include blood pressure, heart rate, peripheral perfusion, and electrocardiogram. Signs of circulatory failure and shock, such as paleness, change in level of consciousness and in peripheral perfusion, should be recorded. Chen et al reported significant hypotension during epidural anesthesia in pregnant women.⁹ Hypotension episodes did not progress, were of moderate intensity ($\leq 30\%$ of reduction in relation to baseline) and were treated effectively with administration of vasopressors (phenylephrine), fluid infusion and uterus displacement to the left. A possible explanation for more frequent episodes of hypotension in patients with COVID-

19 is that the SARS-CoV-2 virus binds to the Angiotensin II converting-enzyme receptor, impairing its normal performance. The receptor plays a cardio-cerebral-vascular protective role, regulating blood pressure and presenting anti-atherosclerotic effect.¹⁵

COVID-19 can cause thrombocytopenia.¹⁶ Due to its potential thrombogenic effect, patients diagnosed with COVID-19 are frequently taking anticoagulants. Analysis of blood clotting tests whenever possible is essential, in addition to acknowledging recommendations on use of anti-coagulants and regional blocks.¹⁷

Liver and kidney failure can occur in more severe cases. Blood tests are useful for diagnosis and follow-up of organ dysfunctions.

Neurological symptoms have been described in patients with COVID-19.¹⁸ Symptoms can be divided into two categories: 1) Central Nervous System symptoms (CNS), such as headache, dizziness, acute cerebrovascular disease and epilepsy; and 2) Peripheral nervous system symptoms, such as anosmia, hypogeusia, hypopsia and neuralgia. Therefore, when faced with the decision on which anesthetic technique is the most appropriate and safe for confirmed or suspected patients of COVID-19, judicial investigation of neurological symptoms potentially present is mandatory, equally to what is done for the pulmonary and cardiovascular symptoms common in these patients.¹⁹ In this way, we can come across cases in which distinguishing post-dural puncture headache and headache due to SARS-CoV-2 infection is difficult. It can also be difficult to distinguish viral neuralgia from neuralgia caused by mechanical injury after a regional block. Last, during spinal anesthesia, the SARS-CoV-2 virus can potentially be carried by the needle into the CNS. It is important to mention that there is no direct evidence of this means of virus inoculation to present. On the other hand, general anesthesia compromises the blood-brain barrier,²⁰ which can facilitate CNS invasion by the virus. Thus, assessment of risk and benefit of regional anesthesia for patients with central or peripheral neurological symptoms should be careful.

Intensive care (ICU) beds may be required for patients with COVID-19. In a retrospective study of 34 patients with confirmed disease, Lei et al found a mortality of 20.5%, and ICU bed required for 44.1% of patients.²¹

Operation room preparation

The surgical unit must be prepared to avoid contact and proximity of patients with suspected or confirmed COVID-19 with patients without the disease. The patient should be taken immediately to the OR where assessment, anesthesia, and recovery will take place, avoiding therefore contamination of other rooms and patient remaining in common areas.

Supplies and medication to be used should be packaged individually.

All patients should be transported to the surgical ward wearing a surgical mask. Additional supplies and medication can be kept outside ORs and dispensed by an assistant when required. We recommend restricting the number of individuals in the OR to the minimum possible required.^{11,22,23}

Routine monitoring should be followed according to Federal Council of Medicine 2017 Resolution 2170.

Procedure for regional anesthesia

Neuraxial blocks are contraindicated for patients with clotting disorders. Regional blocks on deep and non-compressible sites are also contraindicated. Regional anesthesia on superficial and compressible sites can be performed, taking into account risk/benefit for patients with mild to moderate clotting disorders.^{24,25}

Anesthesia can be performed with routine care for COVID-19 negative patients who are not at risk. The rationale for these patients to wear a surgical mask are false negative tests.

Patients should be kept with a surgical mask whenever possible, and anesthesiologists should wear surgical masks throughout contact with patients, along with cap, goggles and gloves.^{16,26} Hand washing for at least 20 seconds is mandatory, but can be replaced by using 70% alcohol.

For patients with confirmed or suspected disease, adoption of personal protection measures is mandatory, that is: impermeable gown (minimum grammage of 30 g.m⁻²), protection gloves, goggles, N95 facial mask or similar, and cap.²¹ Personal Protection Equipment (PPE) should be donned before entering the OR and doffed in the room toward that end, preferably in the presence of an observer attentive to possible contamination.

Despite the recommendation favorable to wearing a surgical mask when in contact with patients with COVID-19 in short and not aerosol-generating procedures,²⁷ the possibility of block failures, need for ventilatory care or conversion to general anesthesia should be considered. In these cases, preemptive use of a N95 or similar mask avoids exposure of the team to any possible urgent scenario.²⁸ In the event of scarcity of N95 masks, surgical masks are acceptable.

Sedation should be avoided, or when required should be minimal and performed carefully to try to avoid ventilatory depression, hemoglobin desaturation and need for supplementary oxygen. Deep sedation and using a laryngeal mask for oxygen supplementation should be avoided in these cases. The functional pulmonary reserve of patients will be low, increasing the risk of adverse events. We recommend adoption of respiratory function sparing techniques for patients with COVID-19.

Nasal oxygen catheters can be installed under the surgical mask, but high gas flows can increase aerosol dispersion and should be avoided.²⁹ Hui et al showed that dispersion distance of exhaled air sideways increases with increase in oxygen flow (20 cm, 22 cm, 30 cm and 40 cm in relation to the sagittal plane, using oxygen flows of 4 L.min⁻¹, 6 L.min⁻¹, 8 L.min⁻¹ and 10 L.min⁻¹ respectively).³⁰ Cough can also increase dispersion to even longer distances.¹¹ Face masks for supplementary oxygen administration replace nasal catheters efficaciously and are preferable. Surgical masks over face masks reduce aerosol dispersion.

Fresh gas flow administered to the patient should be as low as possible to maintain oxygen within normal parameters.

Aseptic techniques should be guaranteed, both for patient and medical team safety.

The SARS-CoV-2 virus has been isolated in the CSF; for this reason, we recommend avoiding dripping during spinal anesthesia.³¹

COVID-19 carriers, as already mentioned previously, can present hemodynamic instability, mainly after neuraxial blocks, and intense hypotension can occur.^{13,32} Vasopressors may be required.

Ultrasound (USG) and neurostimulators during regional anesthesia should be encouraged to improve the quality of blocks, reduce likelihood of failure, and minimize the risks of neurological lesions.³³

Assessment of block installation should be performed to guarantee the quality of anesthesia and avoid deep sedation or possible conversion to general anesthesia.

Choosing the appropriate block and performing it in optimal conditions is essential, preferably by the most experienced anesthesiologist in regional anesthesia.

Post-anesthesia recovery should preferably occur in the OR. If not possible, and the patient is sent to the common post-anesthesia recovery unit along with other patients, there should be a minimum distance of 2 meters³⁴ among them. We do not, however, recommend the practice.

To date there are no specific recommendations as to management of post-puncture headache in patients with COVID-19. The sphenopalatine lymph node block should not be performed routinely because it is a procedure that possibly produces aerosols, increasing therefore the risk of transmission of SARS-CoV-2 to health professionals. The epidural blood patch should be considered carefully in face of the identification of the virus in the CSF. There is the possibility of a significant introduction of viral load, with possible neurological complications.³⁵ If required, it should be postponed to after recovery from infection.

At the end of the procedure, PPEs should be doffed carefully to avoid contamination of the team.³⁶ Previous knowledge of the regional anesthesia technique, and of PPE donning and doffing, training team and professionals, and complying with protection measures are important actions in face of COVID-19. A summary of the recommendations previously described are presented in the info graph that follows, adapted from the American and European guidance¹

Conclusion

Regional anesthesia is an interesting alternative to manage patients with COVID-19. Adoption of the appropriate anesthetic technique minimizes adverse effects in the post-operative period and offers safety to patients and to the health team, as long as care described is complied with.

The judicious use of safety techniques and norms is essential. Knowledge of the specificities of the pathophysiology of the disease and its symptoms helps to decide which anesthetic technique is safer and more appropriate for each patient.

Conflicts of interest

The authors declare no conflicts of interest.

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