# Daring discourse: are we ready to recommend neuraxial anesthesia and peripheral nerve blocks during the COVID-19 pandemic? A pro-con

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## ABSTRACT

The recent joint statement from the American Society of Regional Anesthesia and Pain Medicine (ASRA) and the European Society of Regional Anesthesia and Pain Therapy (ESRA) recommends neuraxial and peripheral nerve blocks for patients with coronavirus disease 2019 (COVID-2019) illness. The benefits of regional anesthetic and analgesic techniques on patient outcomes and healthcare systems are evident. Regional techniques are now additionally promoted as a mechanism to reduce aerosolizing procedures. However, caring for patients with COVID-19 illness requires rapid redefinition of risks and benefits—both for patients and practitioners. These should be fully considered within the context of available evidence and expert opinion. In this Daring Discourse, we present two opposing perspectives on adopting the ASRA/ESRA recommendation. Areas of controversy in the literature and opportunities for research to address knowledge gaps are highlighted. We hope this will stimulate dialogue and research into the optimal techniques to improve patient outcomes and ensure practitioner safety during the pandemic.


## INTRODUCTION

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) pandemic presents an unprecedented challenge to anesthesiologists worldwide. Clinical decisions that just a few weeks ago were routine have become markedly more complex. Every anesthetic choice still requires a full consideration of risks, benefits, and alternatives. However, this has historically been a patient-focused exercise, where practitioner preference or the needs of the care team do not enter the decision-making process. The SARS-CoV2 pandemic has disrupted this process, such that practitioner safety is now incorporated into anesthetic care and planning. Further, the potential effects of anesthetic choice and outcomes must account for consequences related to the healthcare system and availability of potentially scarce resources, should the need arise. These factors have always been present, but they assume a much greater role in our decision making today.

In light of these issues, the age-old question '*which is better—regional anesthesia (RA) or general anesthesia (GA)?*' assumes even greater importance when applied to the care of patients with coronavirus disease 2019 (COVID-19). In healthy cohorts, benefits of RA over GA on patient outcomes, including pulmonary, pain, gastrointestinal, and thromboembolic events, have been established.[1] Likewise, the risks of choosing RA in febrile, bacteremic or viremic patients are probably low, and likely to be outweighed by the benefits.[2] Despite these data, and the recent practice advisory recommending neuraxial anesthesia and peripheral nerve blocks in COVID-19 illness,[3] significant questions remain. Can we assume regional techniques confer similar benefits without increasing risk in COVID-19 cohorts? In the absence of evidence to guide us, should we rely on expert opinion? Is RA really safer for practitioners compared with GA? Here we consider these questions and offer two differing perspectives on the recent practice recommendation.[3]

## YES: WE ARE READY TO RECOMMEND NEURAXIAL ANESTHESIA AND PERIPHERAL NERVE BLOCKS FOR PATIENTS WITH COVID-19

Given how recently SARS-CoV2 has emerged, much is unknown, and minimal data are available to guide our decision making on the optimal anesthetic choices for affected patients. The clinical need is high, so expert opinion combined with an extrapolation of known benefits from healthy patients to patients with COVID-19 is appropriate and pragmatic. This convention is by no means uncommon: indeed 41% of recommendations found in major society-sponsored guidelines for cardiology care are based on expert opinion.[4] This approach is also consistent with the recent joint statement recommending RA for patients with COVID-19.[3]

Nonetheless, we should start by examining the effects our choices have on patient outcomes. Where RA and GA are suitable choices for a patient, RA is typically associated with equivalent or superior outcomes after surgery.[1] Special populations at higher risk of poor outcomes may derive even more benefit. These populations share overlap with those at risk of COVID-19 due to age or immune status. For example, in obstetric patients, neuraxial anesthesia is associated with lower estimated maternal blood loss and higher Apgar scores, and in geriatric hip fracture, with lower mortality, less delirium, shorter duration of intensive care unit (ICU) stay, and less need for ventilator support.[5 6]

In addition to these well-characterized benefits of RA, avoiding GA may reduce the magnitude of the surgical stress response to positively impact outcomes after surgery in patients with COVID-19. This is supported by a recent retrospective analysis of asymptomatic patients who underwent a range of surgical procedures and were subsequently diagnosed with COVID-19. Although the sample size was small, 44% of patients required ICU care, and the mortality rate was 20.5%.[7]

The effects of RA on minimizing pulmonary and thromboembolic complications make this technique particularly suitable for patients with COVID-19 illness. In COVID-19 pneumonia, neuraxial anesthesia would be expected to preserve respiratory function and minimize postoperative pulmonary complications.[1 8] Additionally, hypercoagulable state is increasingly recognized as a feature of COVID-19, and neuraxial anesthesia has been demonstrated to reduce the risk of venous thromboembolism.[1 8 9] The mechanisms by which these gains are achieved are incompletely understood, but may be attributed at least in part to avoiding GA.[1 8] In addition to negative clinical consequences, the downstream effect of these factors is ultimately an increase in resource consumption and a prolonged higher level of hospital care.

While the increased requirements for postoperative ICU care would not stress a health system's capacity during normal times, these are clearly not normal times. Within highly affected geographic regions,

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ICU censuses reached several hundred percent above normal capacity.[10] That increased demand has not only strained ICU care teams but also raised the specter of rationing care. Thus, evidence for anesthetic interventions which can independently reduce ICU admission and resource consumption is especially vital. Although limited data exist, compared with RA, GA is a risk factor for ICU admission and increased resource consumption after orthopedic surgery.[1 8]

A major concern in the current pandemic and one which impacts the choice of RA versus GA is the safety of healthcare workers (HCWs) in the operating room. This concern is well founded with recent estimates suggesting 20% of all COVID-19 cases are among HCWs.[11] There are no definitive data to suggest that performing GA in patients with COVID-19 is safer than RA; on the contrary, evidence suggests GA may increase the risk of exposure and patient-to-HCW transmission.[11 12]Although we lack data derived from experience during the current pandemic, we can be guided by results gathered during the SARS coronavirus (SARS-CoV) outbreak in 2003. Here, the risk of HCW acquisition of SARS-CoV during aerosol-generating procedures was estimated to be sixfold higher, compared with the risk during non-aerosol-generating procedures.[12] Taken together, these data suggest avoiding endotracheal intubation or airway manipulation is imperative. However, they also suggest that the risks to HCWs may be further reduced by incorporating other protective measures. For example, patient face masks minimize the plume of aerosol generated by coughing.[13] The risk of cough and conversion to GA with airway manipulation may be further minimized by providing minimal sedation with RA. Finally, the appropriate use of personal protective equipment (PPE) is likely to reduce the risk of transmission to HCWs even further. The goal of zero transmission may well be achievable by combining these additional measures together with RA. This is suggested by a recent retrospective review of 17 COVID-19-positive patients who underwent cesarean section. Fourteen patients received RA and no cases of transmission to anesthesiologists were reported.[14]

Despite these encouraging reports, there are no studies which assess the downstream effects of GA on other HCWs.[15] The available retrospective analyses have focused primarily on the proceduralist, with very little attention paid to postanesthesia care unit (PACU) and ward-based staff and their risk. If GA is a risk factor for postoperative cough and nausea and vomiting, the question is raised as to whether we are additionally placing our PACU and ward-based colleagues at greater risk of exposure to aerosolized virus.

## Conclusion

Do we know for certain that when RA is chosen over GA for a patient with COVID-19 better outcomes, reduced health system burden, and reduced transmission to HCWs will follow? No. The current body of evidence does not support that conclusion. However, when we combine what we know about the comparative benefits of RA and GA on healthy populations, lessons learned during the SARS-CoV pandemic, and expert opinion, it follows that we are ready to recommend RA as the preferred anesthetic technique for patients with COVID-19.

## NO: WE ARE NOT READY TO RECOMMEND NEURAXIAL ANESTHESIA AND PERIPHERAL NERVE BLOCKS FOR PATIENTS WITH COVID-19

Until we have evidence of improved outcomes in COVID-19 cohorts and protective benefits for practitioners, a sweeping endorsement of RA as the preferred mode of care cannot be made. Although the potential benefits can be inferred from healthy cohorts, there is also significant cause for concern. Risk factors affecting the suitability of RA for patients with COVID-19 are increasingly being described.[16 17] Chief among these are coagulopathy and thrombocytopenia, both of which are reported frequently in COVID-19 illness, and predict disease severity and mortality.[9 18] Careful preoperative assessment should include platelet count and coagulation parameters. Hemodynamic instability is associated with GA in critical illness; however, the potential for poor outcomes associated with hypotensive effects of neuraxial or paravertebral techniques may likewise limit use of RA.[19] Whether spinal anesthesia or brachial plexus blocks can be tolerated in patients with COVID-19 with compromised respiratory function is currently unknown.[16] Impaired cardiac, renal, and hepatic functions are frequently seen in COVID-19 illness, all of which may affect uptake and clearance of local anesthetics.[20] Despite the recent practice recommendation to the contrary, dose reductions are probably indicated for patients with COVID-19, especially for patients with metabolic or respiratory acidosis.[3 20 21] This requirement is unclear in part because most studies of plasma levels of local anesthetics have not been performed in critically ill patients. Any of these factors alone or in combination significantly raise the risk of local anesthetic systemic toxicity (LAST). Avoiding LAST is even more vital during the current pandemic, given the potential need for scarce resources as part of management, including ventilator support or cardiopulmonary bypass.[22]

The recent recommendation for RA in patients with COVID-19 does not distinguish between those with and without critical illness.[3] In this domain, even less evidence is available to guide decision making. Data to support RA in critical illness are derived from small series, uncontrolled trials or are extrapolated from trials conducted in healthy cohorts.[23] Indeed, the only systematic review on the topic concluded that RA may be useful in critically ill patients, but 'no conclusive evidence supporting this assumption exists'.[21] It is important to note that the suitability of GA for patients with COVID-19 critical illness is also not established, and may be associated with specific adverse outcomes. However, until focused research on the comparative benefits of RA and GA in patients with COVID-19 is conducted, the relative safety and efficacy of the techniques remain speculative.

As always, conversion of RA to GA is ideally avoided, but is probably accompanied by higher risk in the patient with COVID-19. The incidence of 'failed RA' is not yet estimated in patients with COVID-19, but there is already speculation that it may be high: wearing PPE impairs visual and auditory acuity, mobility, dexterity, and communication.[16] While not contraindications to performance of RA, these factors should be recognized and studied, because each can affect operator concentration, the success of the RA technique, and the safety of the practitioner. Additionally, patient-related factors may influence conversion from RA to GA in COVID-19 illness. These include obesity, obstructive sleep apnea, patient anxiety, and supplemental oxygen requirements. These factors should be identified and incorporated into anesthetic decision making to minimize the risk of conversion from RA to GA.

Practitioner safety is a key premise of the recent recommendations based on RA as an important mechanism to reduce 'aerosol generating procedures'. The assumption is that RA obviates endotracheal intubation, thereby protecting HCWs from cross-infection. However, this theoretical benefit assumes several factors that are not yet in evidence: (1) that the alternative (ie,

spontaneous ventilation) is associated with lower risk of transmission from patient to provider; (2) that the risks associated with intubation or airway manipulation cannot be properly managed; and (3) no other aerosol-generating events will occur during the course of surgery.

The available evidence on this topic is derived from a systematic review estimating the risk of patient-to-HCW transmission of SARS-CoV, performed in 2012.[12] The informing literature comprised 10 non-randomized studies and the authors concluded that endotracheal intubation was consistently associated with increased risk of patient-to-HCW transmission. However, the authors included a strongly worded caution when interpreting these results: all included studies were deemed of very low quality, with very high risk of bias. Further, they emphasized these data as hypothesis-generating, highlighting the gap in required research and calling for studies with higher methodological quality before the risk of transmission of SARS-CoV from patients to HCWs performing aerosol-generating procedures can be established.

The nature of the risk to HCWs during intubation is likely to be multifactorial and highly amenable to risk modification with appropriate use of PPE. The earliest example of this is found in a retrospective series exploring risk factors for SARS-CoV transmission between patients and HCWs, in which the strongest predictors of transmission were whether the patient was a 'superspreader' and adherence to infection control procedures.[24] A recent retrospective study from Wuhan extended this and found no cases of SARS-CoV2 HCW transmission from 202 patients who underwent emergency intubation.[15] The authors attributed these results to strict adherence to PPE, infection prevention, and airway management protocols.

Adding to the uncertain risk posed by intubation, other studies implicate alternative airway management strategies with elevated risk of patient-to-HCW transmission of respiratory pathogens. These include non-invasive ventilation and use of high-flow oxygen, each of which may be required during surgery under RA with sedation.[12 24] Of even greater concern, recent reports describe efficient transmission of SARS-CoV2 to HCWs in the absence of aerosol-generating procedures, and the risk was higher when episodes of patient care were 120 min or longer.[25] This is consistent with a recent retrospective study assessing the incidence of SARS-CoV2 transmission to anesthesiologists who performed spinal anesthesia for cesarean section or lower limb surgery at 11.4%, despite use of PPE precautions and antiviral prophylaxis.[26]

The source of these HCW acquisitions may be related to close contact and the generation of respiratory particles from an unsecured airway. Although not considered aerosol-generating procedures, coughing and sneezing can produce a significant cloud of respiratory particles of substantial size.[27] Cough, a hallmark feature of COVID-19, is expected to occur throughout a procedure performed under RA with sedation.

### Conclusion

There is no evidence yet that RA is associated with improved outcomes in patients with COVID-19. Importantly, unique risks of RA in this population are incompletely defined. Further, endotracheal intubation may be safer for the anesthesiologist, and care of the patient under RA less safe than previously believed. It follows that until better quality evidence is available, we are not ready to recommend RA as the preferred technique for patients with COVID-19.

## GENERAL CONCLUSION

The recent American Society of Regional Anesthesia and Pain Medicine/European Society of Regional Anesthesia and Pain Therapy practice recommendation is both timely and welcome.[3] However, it raises as many questions as it answers. It is clear we need higher quality evidence to understand the impact of clinical decision making during the SARS-CoV2 pandemic. RA, compared with GA, has established benefits on multiple outcomes for individual patients, populations, and resource consumption. Although it is likely similar benefits will be demonstrated in patients with COVID-19 illness, there is currently no evidence to support this assumption. Until that data are available, expert opinion and routine extrapolation may suffice—however, caution is warranted given the clinical uncertainty surrounding COVID-19 disease and progression. In particular, the risk:benefit of performing RA in a patient with thrombocytopenia and coagulopathy needs to be clarified. The question of transmission to HCWs is likewise unclear, but available evidence suggests that risk depends more on PPE and infection control protocols than the choice of RA or GA, per se. Until the transmission dynamics of SARS-CoV2 are fully characterized, avoiding 'aerosolizing procedures' may not be a necessary component of anesthetic planning. What can be concluded is that the optimal anesthetic care for patients with COVID-19 is controversial and there are arguments for and against both RA and GA. Time, experience, and data are all required before making a definitive recommendation.

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