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Case Report

Dexmedetomidine and worsening hypoxemia in the setting of COVID-19: A case report

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ABSTRACT

Emergency department management of hypoxemia in the setting of COVID-19 is riddled with uncertainty. The lack of high-quality research has translated to an absence of clarity at the bedside. With disease spread outpacing treatment consensus, provider discretion has taken on a heightened role. Here, we report a case of dexmedetomidine use in the setting of worsening hypoxemia, whereby oxygenation improved and intubation was avoided. Well known pharmacologic properties of the drug, namely the lack of respiratory depression and its anti-delirium effects, as well as other possible physiologic effects, suggest potential benefit for patients being managed with a delayed intubation approach. If dexmedetomidine can improve compliance with non-invasive oxygen support (the current recommended first-line therapy) while promoting better oxygenation, it may also decrease the need for mechanical ventilation and thus improve mortality.

1. Introduction

As of this writing, there have been over 1,300,000 confirmed cases of COVID-19 and 80,000 deaths in the United States [1]. While early intubation was the initial recommended strategy for COVID-19 hypoxemia, a large case series in the US as well as data coming out of Britain, China, and Italy suggests a high mortality for patients requiring invasive ventilation [2]. The National Institute of Health now recommends high flow nasal cannula (HFNC) as first line oxygen support [3]. The following case addresses the management of one patient on HFNC, with specific reference to dexmedetomidine.

2. Case description

A 58-year-old female with hypertension presented to a New York City emergency department for shortness of breath for one day in the setting of known COVID-19 diagnosed one week prior. Initial vital signs revealed an SpO2 of 95% on room air. On examination, the patient was tachypneic. Her chest x-ray showed pulmonary infiltrates consistent with COVID-19.

Initially placed on a non-rebreather mask, the patient’s SpO2 gradually dropped and she was started on HFNC (40 L and 88% FiO2). On day 2, oxygen requirements continued to increase and her HFNC was titrated up to 100% at 60 L, with a non-rebreather placed over it. On day 8 (day 15 of illness by symptomatology), SpO2 worsened from 92% to 84%, despite maximal oxygen support. The patient appeared uncomfortable, intermittently attempting to displace her oxygen devices. Intubation was strongly considered. However, with

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1 During this pandemic, our hospital lacked available ICU beds and the patient remained in the emergency department.

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departmental preference toward delayed intubation,\textsuperscript{2} consensus developed to administer dexmedetomidine instead. After, our patient’s SpO\textsubscript{2} increased from 84\% to 100\%, with no other intervention taking place at the time.\textsuperscript{3}

Given the context of gradually worsening hypoxemia, timing of administration, subsequent improvement in SpO\textsubscript{2} and observed change in mental status (from agitated to calm), dexmedetomidine appeared to play a significant role. The patient avoided intubation, now has a stable SpO\textsubscript{2} on nasal cannula and is not in multi-system organ failure, a significant victory considering the alternative. The pharmacokinetics of dexmedetomidine make it ideal in non-intubated COVID-19 patients. It has a minimal effect on respiratory drive, a rapid onset and elimination and is easily titratable \textsuperscript{4}. Its side effect of bradycardia appears to be well tolerated.

On a behavioral level, patients with worsening hypoxia are often very anxious and prone to agitation. This becomes especially dangerous when fully dependent on supplemental oxygen, where acute decline from dislodgement of support devices is always a concern. Dexmedetomidine has been shown in randomized controlled trials to decrease agitated delirium in critically ill patients \textsuperscript{5}. This benefit is likely amplified in elderly populations, who have higher mortality and baseline conditions that predispose them to delirium and noncompliance with HFNC.

Dexmedetomidine may promote oxygenation on a physiologic level as well. The mechanism of hypoxemia in COVID-19 is thought to be disrupted pulmonary vasoregulation due to viral induced endothelial damage of pulmonary capillaries and ensuing V/Q mismatch \textsuperscript{6}. Recent studies suggest dexmedetomidine may enhance hypoxic pulmonary vasoconstriction, improve ventilation/perfusion ratio and consequently improve oxygenation \textsuperscript{7}.

4. Conclusion

The uncertainty of COVID-19 has led to varying approaches in treatment which have yet to be validated and are not without their own risks.\textsuperscript{4} In this case, we believe dexmedetomidine helped one patient avoid mechanical ventilation by improving compliance with non-invasive ventilation and promoting better oxygenation. Whether that was primarily due to behavioral or physiologic changes induced by the drug is unknown. However, this case suggests that the unique pharmacologic properties of dexmedetomidine may help decrease the need for mechanical ventilation, thereby reducing mortality. In the face of this novel and complicated disease, the suggestion of such benefit is deserving of further investigation.

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