

COVID-19-associated acute respiratory distress syndrome (C-ARDS): Inhaled nitroglycerin could be an efficient pulmonary vasodilator

Dear Editor,

We report a case of COVID-19-associated acute respiratory distress syndrome (C-ARDS) in a 57-year-old woman, hospitalized for 43 days and on mechanical ventilation for 18 days. The patient initially had history of high-grade fever for 5 days along with generalized malaise. After 3 days, patient developed dry cough which gradually worsened, and at the time of presentation in hospital, she had shortness of breath and difficulty in breathing. On admission, vitals were heart rate of 108/min, blood

pressure of 122/80 mmHg, respiratory rate of 22/min and oxygen saturation (SpO_2) of 94%. Oxygen therapy was started with face mask at 6 L/min. Gradually, her respiratory parameters deteriorated, and oxygen requirement was increased with face mask to oxygen flow of 10 L/min. Therefore, she was initially placed on a non-rebreathing mask oxygen 10 L/min, followed by high-flow nasal cannula oxygen providing flow of 50 L/min and finally intubated and placed on mechanical ventilation. The ventilator settings were tidal volume 400 ml, respiratory rate 18 per minute, I: E ratio 1:2 and PEEP (positive end expiratory pressure 8cm H₂O) on volume control mode.

During next 48 h, the patient's partial pressure of CO₂ in venous blood (PvCO₂) remained >91 mm Hg, with a maximum value of 105 mm Hg. Patient received intensive care management including sedation, muscle relaxants, antibiotics (ceftriaxone 1 gram intravenous twice a day) and steroid (dexamethasone 8 mg intravenous twice a day). However, the SpO_2

Table 1: Gradual improvement in acidosis and hypercarbia following inhaled nitroglycerin

Parameters	0 h	1:30 h	3:00 h	04:50 h
pH	7.13	7.18	7.27	7.29
p _v CO ₂ (mmHg)	105	94.30	69.40	67.20
pO ₂ (mmHg)	44.80	50.20	52.40	54.10
SaO ₂ (%)	57.40	60.20	67.40	65.40
cLac (mmol/L)	2.50	2.00	1.40	1.10
cGlu (mg/dL)	98	82	135	237
chCO ₃ (mg/dL)	26.50	27.80	28.60	26.70
Anion Gap _c (mg/dL)	7.80	7.30	6.20	8.80

p_vCO₂ - partial pressure of carbon dioxide, pO₂ - partial pressure of oxygen, SaO₂ - oxygen saturation in blood, cLac - lactate value, cGlu - glucose value in blood, chCO₃ - bicarbonate value in blood

remained 60% for approximately 32 h. The ventilator settings were tidal volume of 380 mL, respiratory rate 33/min, FiO₂ 100%, PEEP 20 cmH₂O, peak inspiratory pressure 40 cmH₂O, plateau pressure 35 cmH₂O and I/E ratio 1:1.5 on volume control mode (SV300 ventilator, Mindray, Shenzhen, China). PvCO₂ remained significantly raised at 104 mm Hg with a pH of 7.14. During management, an additional integrated nebulization system was added into the airway circuit with 50 mg nitroglycerin in 100 ml normal saline (Aerogen Pro nebulizer, Aerogen Ltd, Galway, Ireland). Subsequent, venous blood gas sampling from the central line reported reduction in PvCO₂ from 105 to 94.30 mm Hg [Table 1]. The pH increased, PvCO₂ decreased, the requirement of norepinephrine decreased from 40 µg/min to 20 µg/min, and vasopressin was gradually reduced from 0.06 U/min to 0.02 U/min.

COVID-19 is mild in >80% of the patients, and approximately 14–17% patients develop respiratory and breathing complications. Out of these, 5% of the patients develop extreme sickness with multi-organ failure.^[1]

C-ARDS in the present case was managed with inhaled nitroglycerin which resulted in selective pulmonary vasodilation and reduced shunting.^[2] Inhaled nitroglycerin is rapidly metabolized to nitric oxide, a potent pulmonary vasodilator that reduces both the mean pulmonary artery pressure and the pulmonary vascular resistance, while improving ventilation-perfusion (V/Q) matching.^[3] Nitroglycerin is readily available and does not require special equipment, so it may be used in resource-constrained settings. Inhaled pulmonary vasodilators have shown improved right heart function compared to

intravenous administration, but no studies have compared intravenous nitroglycerin with inhaled nitroglycerin.^[3-6] We conclude that nitric oxide delivery system, nebulized nitroglycerin, may be used as an alternative in patients of C-ARDS.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that her name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

Deepak K. Daunaria, Girish K. Singh, Ankit Agarwal, Priyanka Mishra¹

Department of Anaesthesiology, All India Institute of Medical Sciences, Rishikesh, Uttarakhand, ¹Department of Anaesthesiology and Critical Care, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun, Uttarakhand, India

Address for correspondence:

Dr. Girish K. Singh,
Department of Anaesthesiology, All India Institute of Medical Sciences, Rishikesh, Uttarakhand, India.
E-mail: dr.soonu1986@gmail.com

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