Archives of Anesthesiology and Critical Care (Spring 2023); 9(2): 178-180.

Available online at http://aacc.tums.ac.ir

Case Report

Non-Invasive Ventilation via Tracheostomy in COVID-19 Patients Requiring Respiratory Support: Case Report

Kasra Karvandian[1], Shabnam Beigi[1]*, Zahra Ataie-Ashtiani[2], Mohammad Ashouri[3], Narjes Mohammadzadeh[3]

[1]*Department of Anesthesiology, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran.*

[2]*University of Melbourne, Melbourne, Australia.*

[3]*Department of Surgery, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran.*

ARTICLE INFO

Article history:
Received 14 May 2022
Revised 04 Jun 2022
Accepted 18 Jun 2022

Keywords:
Covid-19;
Non-invasive ventilation;
Tracheostomy

ABSTRACT

Since the first wave of COVID-19, different methods for management of COVID-19 ARDS were proposed. Early intubation and mechanical ventilation was performing more than other methods. after several mounths, limitation of equipment in hospitals, made the specialists think of less aggresive methods. NIV was one of suggestion performed before intubation which improve oxygenation of patients. They don't get any sedation and have regular diet. As a result, the need for ICU and ventilator for respiratory support decreases. In this case study, we report a patient that had permanent tracheostomy and hospitalised for COVID-19 ARDS. At first we connected the tracheostomy to a CPAP devise.

The first victim of SARS-COV-2, also known as COVID19, was diagnosed in Wuhun with severe respiratory presentations in December 2019 and since then the disease has gained a global spread, and gaining significant public health attention [1]. The disease mainly causes respiratory symptoms such as dyspnea, cough, sneezing and more systemic presentations such as anorexia, fever, fatigue, and anosmia. The cellular mechanism of the disease is not fully understood, yet so far, we know there is a connection between the ACE receptor & COVID-19 [2]. Given the novelty and rapidity in change of circumstances of information, most of the initial respiratory management was based on cases with significant respiratory distress and hypoxia [3-4].

Here in we discuss a case report of a COVID-19 patient with a permanent tracheostomy due to laryngeal squamous cell carcinoma, and the use of non-invasive respiratory support via CPAP to manage his hypoxia, and briefly review the evidence for the use of non-invasive ventilation in comparison to invasive support such as intubation in patients affected by COVID-19.

Case Report

A 75yo with history of chronic conditions presented to the Imam Khomeini Hospital Complex complaining of progressive fatigue, fever, and dyspnea associated with increased work of breathing. The initial symptoms started around 15 days prior.

On examination the patient was responsive, alert, and oriented, with HR at 85bpm, BP at 142/91 mmHg, RR at 18/min with O2sat of 75% on room air, and slightly febrile with temperature of 38.2 C. On respiratory examination we found dry caugh & mild dyspnea. Lung sound had bilateral and diffuse Crackles. The Cardiovascular exam was unremarkable with bilateral and equal pulses palpated with normal dual heart sounds on auscultation. The head and neck examination revealed a permanent tracheostomy with inserted a cuffless tracheostomy tube placed 15 days earlier, upon T-piece and supplemental oxygen at 8-10 L/min the saturation

The authors declare no conflicts of interest.

*Corresponding author.
E-mail address: shabnambeigi72@gmail.com

improved to 82%. The abdomen was soft and non-tender, with no evidence of guarding, or rebound tenderness.

The patient had hypertension, chronic kidney disease, benign prostate hypertrophy (BPH) and a scheduled coronary angioplasty and coronary stent placement (PCI). Additionally, the patient had a more recent diagnosis of laryngeal squamous cell carcinoma following prolonged episode of hoarseness of voice which was managed surgically via laryngectomy with requirement for a permanent tracheostomy. The current medication included daily intake of 80mg aspirin, 75mg Clopidogrel, 20mg Atorvastatin, 50mg Losartan, Tamsulosin 40mg and 5mg Finasteride. Socially the patient was a farmer, living with his wife, He was a non-smoker and has never consumed alcohol. However, on admission it was found that the patient had extensive abuse of opium drugs.

Initial management included admission and providing supplementary O2 via the T-piece, while the fever was managed with administration of NSAIDs and Acetaminophen. Due to lack of accessibility to rapid PCR testing and high suspicion for COVID19 in this patient, chest CT was ordered demonstrating bilateral widespread ground glass opacity and confirming the preliminary diagnosis (Fig 1). Other routine investigations including CBC diff, BUN, Cr, Na, K, ABG, U/A, FBS, CRP, 12 leads ECG and echocardiography were ordered, there were no signs of ischemic events. The COVID19 treatment protocol was initiated which included 200mg Remdesivir in six doses, 8mg dexamethasone, 5000 unit of heparin trice daily and 500mg acetaminophen trice daily. His routine antihypertensive and alfa 2 antagonist were continued.

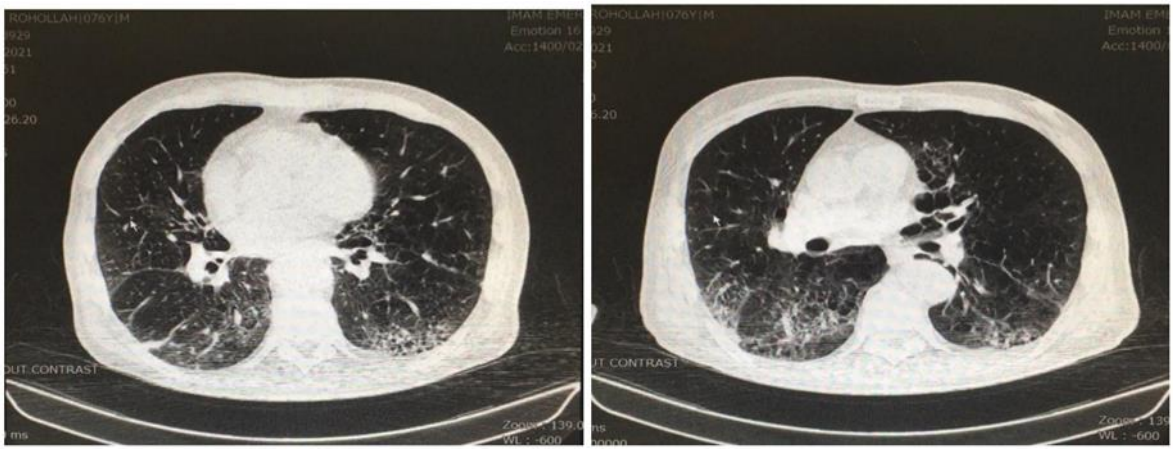
Three days after the admission and initiation of treatment, the patient deteriorated with worsening respiratory distress from mild to moderate distress with exacerbated bilateral crackles on auscultation. The ABG specified pH=7.52, PCO2 =25.1, PaO2=37, HCO3=20.3 and SPO2=77%. The patient remained alert and maintained his haemodynamic stability, while awaiting ICU. As part of management to improve the sustained hypoxia, the patient was connected to a CPAP via the connector to the tracheostomy tube on IPAP=12 and EPAP=5 setting. During the inspiration, air entered the airway with positive pressure and on expiration, the air exited from the area surrounding the tracheostomy site. The patient's clinical status and observations were routinely monitored hourly, with ABG analysis at first and sixth hours since NIV was started. The patient O2sat improved noticeably within minutes of intervention, achieving 90% and continuously improving in the first hour with O2sat stabilising at 95%. The ABG at first and sixth hours were pH=7.47, PCO2 =28.3, PO2=65.7, HCO3=21.0 and pH=7.43, PCO2 =26.2, PO2=79.29, HCO3=20.6 respectively (results summarised in the Table 1).

The patient remained in the hospital for 10 days with the CPAP support, with no further concern for escalation to invasive ventilation support or ICU admission during the acute phase of his infection. After Improving O2 saturation, the patient was discharged home.

Table 1- The serial ABG results

ABG	Before NIV	1hr after NIV	6hr after NIV
PH	7.52	7.47	7.43
PCo2	25.1	28.3	26.2
Po2	37	65.7	79.29
Hco3	20.8	21.0	20.6

Figure1- CT imaging of the patient's chest



Discussion

During the first 3 weeks of the Covid-19 outbreak in the Seattle area, the most common reasons for admission to the ICU were hypoxemic respiratory failure leading to mechanical ventilation [5-6].

Mechanical ventilation continues to be the mainstay of management for severe COVID-19. Early invasive mechanical ventilation (IMV) was promoted early in the pandemic. It revealed that mortality is higher among older patients, receiving IMV [7]. With high numbers of patients requiring invasive ventilation, limited availability of intensive care beds and overstretched resources, 'bridging' or holding measures such as NIV or HFNO were used to improve oxygenation prior to intubation [8-9] and now noninvasive ventilation is using for patient with better respiratory situation and invasive ventilation is neglected for these patients [10-11]. It seems that the efficacy of NIV is very dependent on respiratory care provider [12-13]. Finding patients who benefit from NIV help health care providers to make better decisions for Covid19 hypoxic patients [14] despite studies working on respiratory support, yet there is no full agreement on invasive and noninvasive ventilatory support criteria.

in our patient with permanent tracheostomy after applying basic supports as o2 supplementation we decided to use noninvasive ventilation instead of mechanical ventilation. Using NIV gave the patient the chance to overcome ARDS phase of Covid19 without sedative medications and after 3 weeks of hospital admission the patient could breathe without NIV support independently and discharged home.

Conclusion

Thankfully this patient responded well to NIV support via his tracheostomy as this reduces the need for sedation, risk of aspirating pneumonia and requirement for close monitoring and ICU bed availability. he was discharged home. Even though more rigorous systematic review is needed to indicate the short and long term benefit of NIV in this specific group of patients.

References

[1] Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. J Med Virol. 2020; 92(4):401.

[2] Chan JF, Yuan S, Kok KH, To KK, Chu H, Yang J, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. Lancet. 2020; 395(10223):514-23.

[3] Patel A, Jernigan DB; 2019-nCoV CDC Response Team. Initial Public Health Response and Interim Clinical Guidance for the 2019 Novel Coronavirus Outbreak - United States, December 31, 2019-February 4, 2020. MMWR Morb Mortal Wkly Rep. 2020; 69(5):140-146.

[4] McEnery T, Gough C, Costello RW. COVID-19: respiratory support outside the intensive care unit. Lancet Respir Med. 2020; 8(6):538-9.

[5] Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, et al. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. JAMA. 2020; 323(20):2052-2059.

[6] Bhatraju PK, Ghassemieh BJ, Nichols M, Kim R, Jerome KR, Nalla AK, et al. Covid-19 in critically ill patients in the Seattle region—case series. N Engl J Med. 2020; 382(21):2012-22.

[7] Lim ZJ, Subramaniam A, Reddy MP, Blecher G, Kadam U, Afroz A, et al. Case fatality rates for COVID-19 patients requiring inva- sive mechanical ventilation: a meta-analysis. Am J Respir Crit Care Med. 2021; 203(1):54-66.

[8] Carter C, Aedy H, Notter J. COVID-19 disease: Non-Invasive Ventilation and high frequency nasal oxygenation. Clinics in Integrated Care. 2020; 1:100006.

[9] Li J, Fink JB, Ehrmann S. High-flow nasal cannula for COVID-19 patients: low risk of bio-aerosol dispersion. Eur Respir J. 2020; 55(5).

[10] Tobin MJ, Laghi F, Jubran A. Why COVID-19 silent hypoxemia is baffling to physicians. Am J Respir Crit Care Med. 2020; 202(3):356-360.

[11] Ryan L, Lam C, Mataraso S, Allen A, Green-Saxena A, Pellegrini E, et al. Mortality prediction model for the triage of COVID-19, pneumonia, and mechanically ventilated ICU patients: a retrospective study. Ann Med Surg (Lond). 2020; 59:207-16.

[12] Dar M, Swamy L, Gavin D, Theodore A. Mechanical-ventilation supply and options for the COVID-19 pandemic. Leveraging all available resources for a limited resource in a crisis. Ann Am Thorac Soc. 2021; 18(3):408-16.

[13] Chillag KL, Lee LM. Synergistic disparities and public health mitigation of COVID-19 in the rural United States. J Bioeth Inq. 2020; 17(4):649-56.

[14] Wunsch H. Mechanical ventilation in COVID-19: interpreting the current epidemiology. Am J Respir Crit Care Med. 2020; 202(1):1-4.