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Covid-19 Pneumonia and Use of High Flow Nasal Oxygen Therapy($HFNO_2$):Case Series

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ABSTRACT
Patients infected with SARS CoV2 commonly develop severe pneumonia and respiratory failure which often require ICU support in a form of either NIV or invasive mechanical ventilation.Toavoid need of NIV or invasive mechanical ventilation, we tried use of high flow nasal oxygen which is more comfortable and acceptable to the patients. We did a case series of 5 patients. We observed that use of HFNO decreased the need of NIV and intubation and successfully improved the patients.
Key words: $HFNO_2$,,COVID-19,pneumonia

I. INTRODUCTION

Coronavirus disease (COVID-19) is potentially fatal infection caused by novel severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) [1]

SARS-COV 2 is causative agent of coronavirus disease (COVID-19). It is highly contagious and has a potential for rapid progression to ARDSi.e. Acute Respiratory Distress Syndrome. Initial approach for treating severe COVID -19 pneumonia centered around invasive mechanical ventilation and standard lung protective strategies recommended for ARDS.[2] But there are some complications like VILI (VENTILATOR INDUCED LUNG INJURY) and systemic inflammation associated with mechanical ventilation. Other strategies to improve oxygenation may be more appropriate in patients with hypoxemic respiratory failure who do not require ventilatory support. [3]This lead to thought of using alternative treatment for ARDS like HFNO. This system consists of air/ oxygen blender, an active humidifier, a single heated circuit and nasal interface. It can deliver humidified gas flows upto 60L/min and it is associated with many advantages like significantly reduced need for intubation and mechanical ventilation, It decreases work of breathing , reduces anatomical dead space, supplies constant fraction of humidified oxygen.[4],[5]

We present here series of 5 cases COVID -19 pneumonia patients treated with HFNO in our hospital. Out of these 5 cases, 3 had good recovery and 2 had fatal outcome.

(Image 1- HFNO Machine)

CASE 1

24 years male presented with complaints of cough and breathlessness since 5 days. His HRCT score was 17/25.

On arrival his SpO2 was 82% on RA and respiratory rate i.e. RR was 38/min. His TLC =15300 , ESR = 54, CRP= 107, D-dimer = 1465 and Ferritin= 2601. Patient was taken on R-bag @15L/min where his saturation improved to 88%with RR of 30/min. patient was then taken on HFNO at flow of 30L/min at FiO2 of 100% where his saturation improved to 98% and RR became

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22/min. patient was slowly tapered off HFNO over 8 days. Patient was discharged from hospital to home isolation after 19 days of hospitalisation. At discharge his TLC=8400, ESR=35, CRP=1.6 , D-dimer=289, Ferritin = 617.

CASE 2

55 year male came to hospital with complains of breathlessness and cough since 1 day. His HRCT score was 23/25.

On admission his SpO2 was 50% and RR was 44/min. his TLC=13800, ESR= 25, CRP=79, D-dimer= 6200, Ferritin= 879. Patient was immediately put on R-bag @ 15L/min where saturation increased to 70% and RR to 30/min. patient was then taken on HFNO at flow of 40L/min and FiO2 of 100% and his saturation improved to 84% and RR became 34/min. decision was taken to take patient on NIV but because of unavailability of ICU bed patient succumbed to death in ward. His last recorded TLC= 17000, ESR=54, CRP=127, D-dimer= 7000 and Ferritin=1640.

CASE 3

50 years male presented with complaints of cough and breathlessness since 2 days. His HRCT score was 20/25.

On admission his TLC=11200, ESR=22, CRP=121, D-dimer=1190 and Ferritin=2545. His SpO2 at room air was 80% and RR was 34/min. patient was taken on R bag @15L/min where saturation improved to 94% and RR to 30/min. because of tachypnea patient was taken on HFNO @ 40L/min flow and FiO2 of 100%. On HFNO saturation improved to 97% and RR settled to 26/min. patient was shifted to ICU where patient was in intermittent NIV on PS mode at FiO2 of 80% Ps= 10 and PEEP of 8. Patient was in ICU for 5 days and then shifted to ward on Nasal prongs. O2 requirement was gradually tapered and patient was discharged after 24 days of hospitalisation. At time of discharge his TLC=6420, ESR=15, CRP=1.0, D-dimer=240, Ferritin=570.

CASE4

42 year male came to triage with complaints of fever, cough and breathlessness since 2 days.His HRCT score is 18/25.

On admission his Spo2 was 80% on RA and RR was 38/min. his TLC=3890, ESR= 95, CRP=196, D-dimer=1841, Ferritin=1063. Patient was immediately taken on R-bag where saturation improved to 88% and RR to 32/min. patient was then taken on HFNO @30L/min and FiO2 of 80%. His saturation improved to 97% and RR decreased to 20/min. patient was slowly tapered off HFNO over 4 days and was discharged to home isolation. At discharge his TLC=3240, ESR=50, CRP=1.4, D-dimer=290, Ferritin= 600.

CASE 5

52 years male presented with complaints of cough and breathlessness since 3 days. His HRCT score was 17/25.

On admission his TLC=8200, ESR=20, CRP=121, D-dimer=1300 and Ferritin=1845. His SpO2 at room air was 80% and RR was 35/min. patient was taken on R bag @15L/min where saturation improved to 88% and RR to 30/min. because of tachypnea patient was taken on HFNO @ 30L/min flow and FiO2 of 100%. On HFNO saturation improved to 90% and RR settled to 26/min. patient was shifted to ICU where patient was in intermittent NIV on PS mode at FiO2 of 80% Ps= 10 and PEEP of 8. Patient was in ICU for 5 days and then shifted to ward on Nasal prongs. O2 requirement was gradually tapered and patient was discharged after 24 days of hospitalisation. At time of discharge his TLC=7420, ESR=15, CRP=1.0, D-dimer=230, Ferritin=420.

(Image 2- Patient with HFNO Machine)

II. DISCUSSION-

In our case series of 5 patients, $HFNO_2$ was successfully utilised to provide respiratory support to 3 patients with COVID-19 pneumoniaand avoided mechanical ventilation and returned to home for isolation. 2 patients out of 5 were transferred to ICU and 1 succumbed to death before getting to ICU.

Out of 5, 1 patient was young male 24 years old, other are middle aged.

24 yr old patient(HRCT = 17/25)was having room air saturation of 82% with RR of

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38/min which improved to SpO2 of 88% and RR of 30/mins on R-Bag with O2 flow of 15 L/min. He was taken on HFNO with flow rate of 30 L/min and FiO2 of 100% which significantly improved his condition as his SpO2 became 98% and RR reduced to 22/min. With 8 days of support, HFNO was gradually tapered , patient was then shifted on O2 by mask at 2L/min maintaining saturation of 98% for 1 day. After 2 days of observation patient was discharged from hospital to home isolation when patient was maintaining saturation of 96-97% at room air without tachypnea.HFNO is more than just a oxygen supplementation,it very well tolerated ventilatory assist device with multiple potential advantageous physiological attributes that is easy to apply and safe[7]

Our 2nd patient 55 year male had complaints of cough and breathlessness. His HRCT score was 22/25 with SpO2 of 80% on room air and RR of 34/min. he was immediately taken on R-Bag support at 15 L/min which improved his SpO2 to 94% but RR still not settled i.e 30/min. So patient taken on HFNO at 40L/min with FiO2 of100% and SpO2 became 94% and RR became 26/min. Decision was taken to shift patient to ICU for NIV support. Patient was put on NIV supportwith FiO2 of 80% PEEP of 8 and Ps of 10 on which his saturation and RR improved to 99% and 22/min respectively. Patient was on NIV for 5 days and after that he was shifted to ward with nasal prongs at 2L/min. After 2 days of observation at room air SpO2 was being maintained at 95% and RR was 22/min so patient was discharged from hospital to home isolation.

3rdpatient, 55 year male came to triage with complaints of cough and breathlessness with HRCT score of 23/25. His room air saturation was 50% and was very tachypneic with RR of 44/min. On R-bag his SpO2 improved to 70% and RR decreased to 30/min so patient was taken on HFNO with flow of 40L/min and FiO2 of 100%. After HFNO SpO2 increased to 84% and RR became still high i.e 34/min. Due to his deteriorating condition decision was taken to shift patient to ICU for NIV support but because of unavailability of bed patient succumbed to death.High flow nasal oxygen failure is relatively more in older patients and those with significant increase in respiratory rate[6]

4th patient 42 year male had complaints of fever, cough and breathlessness with SpO2 of 80% on room air and RR of 38/min. his HRCT score was 18/25. Saturation increased to 88% and RR to 30/min on R-bag at 15L/min. So patient was taken on HFNO at 30l/min flow rate and FiO2 of 80% where his SpO2 increased to 97% and RR settled to 22/min. After 4 days slowly O2 was tapered and over the time patient was taken on O2 mask at 2L/min whenSpO2 still getting maintained at 99% on O2 mask. After 2 days of observation on Room air patient was discharged to home isolation with SpO2 of 97% on Room air.

5th patient

A 52 yr male had cough and breathlessness with SpO2 of 80% on room air and RR of 35/min. His HRCT score was 17/25. His saturation increased to 88%and his RR became 30/min on R-bag at 15L/min. on HFNO at 30L/min his SpO2 increased to 90%and RR decreased to 26/min, he was shifted to ICU for NIV support for 5 days patient was then weaned to nasal prongs and O2 was gradually tapered.

III. CONCLUSION-

So in our case series of 5 patients, 2 patients whose lung involvement was relatively less with lesser HRCT score as compared to others were successfully improved with $HFNO_2$ support without need of mechanical ventilation and ICU backup and were discharged to home isolation. Their age was relatively less (24 and 42 yrs) as compared to others (50 and 55 yrs) while other patient was 50 year old with higher HRCT score was also relatively improved on $HFNO_2$ (SpO2 of 97% from 80% and RR from 34 to 26/ min).

But as tachypnea was still not settled completely, they needed ventilator support with NIV for 5 days after which he was shifted to ward on nasal prongs and we could discharge him from hospital once he started maintaining saturation at room temperature.

Unfortunately our 55 year old patient came to hospital in already deteriorated condition with SpO2 of 50% and RR of 44/min and almost 92%with lung involvement (HRCT of 23/25). Still was better than initial condition after HFNO (saturation increased to 84% and RR to 34/min). He needed mechanical ventilation but before we could arrange an ICU bed for him he succumbed to death.

So at the end as per observation, 2 patients who recovered completely with $HFNO_2$ support without need of mechanical ventilationwere relatively youngwith relatively less lung involvement

The patients who required mechanical ventilation with NIVand then shifted to ward was relatively old with more involvement.

The patient whose death occurred was already in deteriorated condition with no ICU BED availability. As per this case report we can manage cases with covid-19 pneumonia with HFNO decreasing need of mechanical

ventilationandinvasive intubation. We could successfully manage patients with lung involvement (> 50%). HFNO is better tolerated by patients than NIV. It generated high PiO2, generates low levels of Positive pressure and provide washout of dead space in upper airways thereby improving mechanical pulmonary properties

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