Can 'HFNC' be applied safely in COVID-19 patients in the ICU?

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Abstract:
The new Coronavirus disease (COVID-19) affecting the whole world caused a massive pandemic. The most obvious effects of the virus are seen in the lungs, and Mechanical ventilation therapy is the main treatment approach in the intensive care unit. However, the management of each patient who was intubated was not successful, and it was observed that some of these patients died. Some patients may benefit from supportive oxygen therapy and High Flow Nasal oxygen therapy. Supportive oxygen therapies applied with a mask, nasal cannula or reservoir mask have limited benefits, and also long-term high-percentage oxygen therapy can cause toxic effects. While high-flow oxygen therapy can be an effective treatment method in preventing intubation, it may raise concerns in terms of spread through droplets. By using the method we apply to minimize the contamination risk, we are able to manage our patients successfully and safely.

To the editor:
The new Coronavirus disease (COVID-19) caused by the SARS-CoV-2 virus has triggered a significant pandemic. The worst effect of COVID-19 infection occurs in the lungs. Mechanical ventilator treatment is one of the primary treatment methods in patients who need intensive care during this process. However, in the clinical follow-up, our experience shows that the patients who were intubated had worse clinical outcomes, that these patients were difficult to wean from mechanical ventilator, and mortality was high. Is there another method that can fix their oxygenation without intubating these patients? Applying oxygen with a mask has only a limited effect. A more effective method may be mask application with a reservoir. Nevertheless, this method can be toxic because of a high percentage of oxygen using over 6 hours. Some of these patients have respiratory distress and tachypnea, but we observed perfect consciousness level in this period. Should we intubate these patients immediately? Could high flow nasal cannula be applied in these patients?
Gattinoni et al. [1] divided patients into two phenotypic groups, in the COVID-19 process. Patients in the L group, which are called silent hypoxemia, the compliance of these patients is suitable. It is not like classic ARDS. In these patients, applying high PEEP during mechanical ventilation therapy can be harmful. Therefore, HFNC therapy may be preferred in such patients [1]. However, patient cooperation is crucial at this point. There may be significant problems during this method, for example, the necessity of closely following the patients in terms of clinical worsening. If there is no positive response in the first hour (refractory hypoxemia, tachypnea, insufficient tidal volume), patients should be evaluated for invasive mechanical ventilation. The second significant problem is the opinions that viral infection can increase the transmission by droplets. Society of Intensive Care has published an algorithm that HFNC should be considered in patients who do not tolerate supportive oxygen therapy, in patients that do not need intubation [2]. We know that HFNC offers many advantages. However, the failure of HFNC therapy can lead to delay in intubation and worse clinical outcomes [3]. If HFNC therapy is possible in terms of transmission risk, it will be beneficial to reduce this risk in single-patient rooms. Actually, the interfaces of the system are fully seated, and more importantly, looseness in the lines is not allowed [4]. We paid attention to put a surgical mask on our patient's face in order to minimize the risk of transmission; also, the use of personal protective equipment was entirely available for all ICU staff. In addition, during the HFNC therapy, a protective nylon barrier, similar to Helmet, was placed on the patient's head (Figure 1). Thus, another extra safety equipment has been taken in terms of droplet contamination.
In our clinical experience, high-flow nasal oxygen therapy with this method was applied to 7 patients who were admitted to the intensive care unit with respiratory distress. The consciousness levels of the admitted patients were sufficiently cooperative-orientated. The mean age of the patients was 56 (45–88) years. Arterial blood gas analysis in the emergency room as follows: the mean pH value of 7.48 [7.25–7.51], 7.44 (95% confidence interval [CI], 7.36–7.53), the mean PaO2 of 52mm Hg [41–53], 49 (95% CI, 44–53mmHg), the mean PaCO2 of 32 mm Hg [30–40], 34 (95% CI, 30–38 mm Hg). After the start of 40 L / min and 100% FiO2 high flow nasal cannula therapy, the first-hour results were as follows: the mean pH value of 7.47 [7.32–7.52], 7.45 (95% CI, 7.39-7.51), the mean PaO2 of 73 mm Hg [35–99], 69 (95% CI, 49–90 mm Hg), the mean PaCO2 of 36 mm Hg [30–56], 38 (95% CI, 29-48 mm Hg). Fourth-hour results were as follows: the mean pH value of 7.47 [7.36–7.52], 7.46 (95% CI, 7.41–7.51), the mean PaO2 of 117 mm Hg [79–159], 114 (95% CI, 91-136 mm Hg), the mean PaCO2 of 32 mm Hg [30–40], 33(95% CI, 29–36 mm Hg). In the clinical follow-up, although the patients were seriously hypoxic, 5 patients were discharged

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to the service without any intubation, while two patients were intubated during their follow-up and the P / F ratio deteriorated very rapidly. These 2 patients died in 48-72 hours. A 46-year-old female patient who died had a diagnosis of acute myeloid leukemia. The other patient who received intensive care in the late period was a 77-year-old male patient with comorbid factors such as diabetes, hypertension and obesity. In the surviving patient group, the period of admission to intensive care was earlier, none of them were obese, but they had additional diseases such as hypertension and diabetes. Age distributions of surviving and deceased patients were similar.

When the pH and PaCO2 values were compared in the 0, 1, 4 hours results, there was no significant difference ($p > 0.05$). However, when the zero and first-hour results are compared in terms of PaO2, the PaO2 values at the first hour were significantly improved than the zero-hour results ($p=0.006$). Also, when the first and fourth-hour results were compared, the fourth-hour results were significantly higher than the first-hour results ($p=0.008$). Descriptive statistics are given as PaO2 and FiO2 instead of the more valuable P / F ratio for ARDS in order to see the intubation requirement and PaO2- PaCO2 level more clearly. All data were taken from patient files retrospectively and given only by descriptive analysis.

According to the experience we have gained from our patients, HFNC therapy can be successfully performed in most conscious patients with respiratory distress. However, patients with respiratory distress and a decreased P / F ratio during the application of HFHC, require intubation. Unfortunately, these patients are often lost.

As a result, HFNC treatment has been successfully applied with close follow-up in most conscious patients with respiratory distress in the fight against COVID-19. However, additional precautions must be taken to protect healthcare professionals and all other patients from droplets while applying this treatment.

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Figure 1: Our High Flow application method (with a protective nylon barrier

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