EDITORIAL

Respiratory Care for Severe COVID-19

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Abstract

Coronavirus disease-2019 (COVID-19) pandemic has put a severe strain on the healthcare services around the globe. Among the most affected areas of the hospital is critical care. A large number of patients of COVID-19 need critical care especially respiratory care. The acute hypoxemic respiratory failure (AHRF) due to COVID-19 needs careful understanding and strategies for management. Research in AHRF due to COVID-19 has progressed rapidly over the last 6 months.

Keywords: Acute hypoxemic respiratory failure, Acute respiratory distress syndrome, Coronavirus disease-2019, HFNO, Invasive mechanical ventilation, Noninvasive ventilation, Prone position, SARS-Cov-2.

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Ever since the first reported case of coronavirus disease-2019 (COVID-19) from Wuhan, China, till now, the pandemic has caused a huge strain on the humanity in general and the healthcare facilities in particular.

All continents of the world are currently showing a large number of patients getting affected due to this pandemic. Although the larger proportion of patients are asymptomatic or mildly symptomatic, and only a very small proportion of patients have become critically ill, the sheer high number of patients has resulted in a severe strain on the healthcare facilities in general and intensive care units (ICUs) in particular. This pattern had been reported from China initially[1], followed by reports from the US, Italy, and other parts of the world.[2,3]

There are a number of aspects of management of these critically ill COVID-19 patients that pose a challenge to the intensive care services of a hospital. From creating a separate section of the hospital for these designated patients, to staffing issues, healthcare workers protection, appropriate management of these patients, administrative issues, and psychological issues—all have challenged the ICU services. Hospitals including the Indian centers have been adapting to these demands by developing excellent services in response to these challenges.[4] Changing administrative requirements of the healthcare authorities and the rapidly evolving understanding of the medical aspects of the pandemic demanded that the ICU services be constantly alert to changing situations.

The main reason for the utilization of the critical care unit was clearly the respiratory failure associated with COVID-19. Subsequently, however, it became clear that additionally, many of these patients had sepsis, myocardial dysfunction, septic shock, acute kidney injury (AKI), and coagulopathy.[1–3] The presentations, impact, and outcomes of these patients were reasonably similar in many parts of the world, with some differences.[1–3]

The first case from India was reported in January 2020. Subsequently, there has been a huge outbreak with nearly a million cases by mid-July. The maximum impact in India was seen in the state of Maharashtra, with nearly 30% of the total cases from the country. It is therefore appropriate that Shukla et al.[5] have described the initial report of the critical care-related aspects of COVID-19 in India from this state, maximally affected.

Interesting pointers come out from this report. Out of the 300 initial admissions in this single center study, only 24 [8%]

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required ICU admission. The rates of ICU admissions and critically ill patients are much higher in previous reported case series from other parts of the world.[1–3] The WHO–China Joint report of a large cohort of COVID-19 patients had 6.1% patients who were "critical" and 13.1% as "severe".[6] In the present study,[5] the relatively smaller number of patients requiring ICU admissions could be partially at least explained by the fact that during this stage of the pandemic, all patients who were tested positive by reverse transcription polymerase chain reaction (RT-PCR) were essentially hospitalized, irrespective of the need for hospitalization. This brought in a dilutional factor and caused skewed percentage of seriously ill patients. Worldwide the percentage of patients who have required critical care services has varied between 5% and 32%.[7,8]

All the 24 patients in the study by Shukla et al.[5] had moderate to severe acute respiratory distress syndrome (ARDS) as per the Berlin definition.[9] Gattinoni and colleagues[10,11] have tried to distinguish the respiratory failure of COVID-19 from the other "typical ARDS" because of the reasonably normal compliance of these patients despite severe hypoxia (categorizing them as severe ARDS by Berlin definition). In fact, Marini and Gattinoni proposed the new terms COVID acute respiratory distress syndrome (CARDS)[12] as a different ARDS in these patients. They also drew attention to the underlying mechanism of the severe hypoxia (abnormal V/Q shunt) due to the vasoplegia associated with microthrombi in the initial stage. They divided the severe ARDS into type L or H, based on the compliance.[10–12]

Autopsy studies performed in the US, Italy, Germany, and China have confirmed the presence of extensive microthrombotic process in the endothelium as well as the typical histological features of diffuse alveolar damage (DAD).[13–17] Most of the studies showed the development of typical DAD consistent with

ARDS.[17] The understanding of these pathophysiological changes in the development of ARDS is important from the therapeutic perspective. Gattinoni and colleagues[18] proposed that the spontaneously breathing patients, on noninvasive ventilation (NIV), would develop patient self-induced lung injury (P SILI) and then progress to the typical low-compliance severe ARDS.[19]

Besides the investigational antiviral agents and immunomodulatory agents, the management of these patients essentially consists of respiratory support. Majority of the patients with mild to moderate hypoxia will be managed by oxygen support of varying degrees with different devices and interfaces. An interesting emerging technique has been to support these patients with oxygen (nasal, high flow, or through NIV) and asking them to adopt a prone posture. Labeled as "awake prone" position, this technique has been used in a significant proportion of patients with good results.[20–23] A study PRONCOVID[24] published from Italy showed prone positioning was feasible and effective in rapidly ameliorating blood oxygenation in awake patients with COVID-19-related pneumonia requiring oxygen supplementation. The effect was maintained after resupination in half of the patients.[24]

The choice between high-flow nasal oxygen and NIV has been extensively debated on the basis of availability, resources, location, efficacy, and risks of transmitting the infection.[25,26] In units which have resources for both, high-flow nasal oxygen is preferred for its lower aerosol-generating capacity.[27]

When patients continue to have significant fatigue, severe hypoxia, coexistent myocardial dysfunction, sepsis, or increasing work of breathing, a call for invasive mechanical ventilatory support needs to be taken. The timing of this decision-making is probably crucial.[28,29] There have been proponents of both early intubation (to adequately rest the respiratory muscles, reduce the drive and work of breathing and thus limiting P SILI) and delaying invasive ventilation as much as possible (in view of the high mortality in intubated patients). Arguments can be erected in support of either of these strategies.[18,29] Due to the nonuniformity of the patients (e.g., stages of disease, comorbidities), the exact phenotypes who would benefit by invasive ventilation has not yet been defined.[18] When intubated and invasively ventilated, the ARDS guidelines [e.g., low tidal volume, limiting plateau pressure, moderate to high positive-end expiratory pressure (PEEP)] are recommended.[27] Although studies have shown poor recruitability of these patients,[30] perhaps bedside tests to determine the subgroup which is recruitable[31] should be more appropriate.

In the current study[5] the mortality of this small set of patients is low as compared to the very high death rates in patients with respiratory failure in previous studies.[25,27,28] To interpret the mortality rates is, however, difficult because of multiple cofactors. These include the actual cause of death, the contribution of COVID-19 in it, the extent of organ dysfunction, the availability of facilities, and the complexity of decisions related to "do not resuscitate" orders.[32]

The limitations of the current study have been well defined by the authors.[5] A single center, small sample study has significant limitations especially when internationally large datasets on many aspects of the care are becoming available. The merit, however, is in the attempt to define if the early patient set in India has any difference from the rest of the world.

Coronavirus disease-2019 has provided huge challenges, in many ways and numbers than at any time in the history of mankind. The field of critical care medicine has been one of the most severely tested. In these times, we have learnt a lot about a totally new disease. There is still a long way to go and all scientific information toward the appropriate understanding is going to lead us in the right direction.

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