Review Article

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Effect of Awake Prone Position in Covid-19 Patients with Mild-Moderate Symptoms to Reduce the Risk of Developing into Severe Cases : A Systematic Review

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ABSTRACT

Introduction: The prone position is a method to increase ventilation in the breathing process. This study will carry out a systematic review of previous journals that discuss the impact of the awake prone position on corona virus disease-19 patients which can reduce the risk of developing into a severe case.

Methods: A literature search was conducted in the last 5 years of research selected from several indexed electronic databases (Scopus, Science Direct, PubMed, Web of Science). A total of 27 8 articles were obtained, and after being selected, 1 2 were found to be selected based on criteria and were a randomized control trial, Cohort Retrospective Study , case control.

Results: 8 articles explaining that the awake prone position is effective in improving hypoxic conditions marked by increased oxygen saturation in the blood of corona virus disease-19 patients with mild-moderate symptoms.

Conclusion: The awake prone position exercise is still the main choice for therapy in corona virus disease-19 patients with mild-moderate acute respiratory distress syndrome. Because it causes an increase in oxygenation and mechanical respiratory function in patients thereby reducing the risk of becoming a severe case.

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Introduction

Coronavirus disease- 2019 (COVID-19) is an infectious disease caused by acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first case was diagnosed in Wuhan, China in December 2019. Moreover, its rapid spread worldwide caused it to be declared a pandemic by the World Health Organization (WHO) on March 11, 2020. Currently recorded as the largest outbreak of the 21st century, this pandemic can produce more serious health consequences. It should be understood that the impact of this pandemic is not only limited to the morbidity and mortality directly caused by infection. The spike in cases of Coronavirus Disease 2019 (COVID-19) has burdened health services in several countries [1]. Persistent hypoxemia is a common presentation in patients with severe COVID-19. A large number of hospitalized COVID-19 patients meet criteria for acute respiratory distress syndrome (ARDS), which requires invasive mechanical ventilation and high levels of patient care [2]. The prone position has been proven to increase oxygenation so that it can reduce mortality for patients with acute respiratory distress syndrome (ARDS) who are intubated ranging from moderate to severe [3]. In addition, a prone position in non-intubated patients, called the awake prone position, has been tried for patients with acute hypoxemic respiratory failure, and has been shown to improve oxygenation and potentially avoid intubation [4]. Several studies have reported an increase in oxygenation with a decrease in respiratory effort when applied earlier in COVID-19 patients with acute respiratory failure [5]. In non-mechanically ventilated COVID-19 patients with severe ARDS, those who received prone ventilation had a lower mortality rate [3].

Based on available data as of 16 April 2020, the number of confirmed cases/millions is 2732 in Italy, 207 in Korea, 909 in Iran, 982 in Bahrain, 3864 in Spain, 57 in China, 68 in Japan, and 168 in the Kingdom of Saudi Arabia (KSA). For mortality rate data, Italy reported the highest death rate (13.1% on 16 April 2020), while Iran (6.3%), China (4%), Spain (10.4%), France (11.6%) and Korean (2.1%) [6].

The prone position is a breath physiotherapy therapy with the method of positioning the thoracic cavity lower than the abdominal cavity. The main mechanism for better oxygenation in the prone position is the reduction of the shunt. Reduced shunt can result from more perfusion in a ventilated area or more ventilation in a perfused area. The previous mechanism (supine position) may be unusual because blood flow continues to predominate dorsally in the prone position. An increase in chest wall compliance in the prone

position is caused by an increase in abdominal pressure [7]. The prone position increases ventilation/perfusion ratio and recruitment of dorsal lung segments, resulting in opening of collapsed dorsal alveoli with better gas exchange and oxygenation [8]. However, the clinical results of the prone position in COVID-19 patients are still unclear from the literature. Therefore, a systematic review is needed to examine the effectiveness and safety of the prone position in COVID-19 patients before recommendations are issued.

In this study, a systematic review will be carried out of previous journals that discuss the effect of the prone position on COVID 19 patients with mild-moderate symptoms to reduce the risk of developing a more severe condition.

Research Method
The literature search process was carried out in the last 5 years (2018-2022) research in English selected from several indexed electronic databases such as Scopus, Science Direct, PubMed, Web of Science and the results of the paper search followed the appropriate protocols and rules using checklists and diagrams Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA). The strategy used to find articles is to use the PICOS framework. Articles are identified by keywords and Boolean logic in the prone position AND COVID 19's patient AND reduce severe OR critical illness.

Tabel 1: PICOS Systematic Review Format

PICOS frame	Inclusion criteria	Exclusion criteria
Population	Studies that focus on COVID 19 patients with mild-moderate symptoms	Studies that do not address the concerns of COVID 19 patients
Intervention	The prone position intervention given to respondents.	Studies that do not discuss the effect of giving interventions to respondents.
Comparator	The comparison intervention group used was other interventions such as chest wall loading and the only observed group without intervention.	There are no exclusion criteria
Outcome	A study describing the prone position intervention in COVID 19 patients with mild-moderate symptoms.	Does not address prone position intervention.
Study and publication	Randomized control trial, cohort retrospective study, case control study, retrospective study	cross sectional study, pilot study, pre-experimental study

Population
The total number of respondents to this review is 1,189. The total population involved was between 45 and 237 participants. The highest number of population is 237 participants. The participants involved were limited by several criteria such as age, pre-treatment clinical examination, experience related to medical treatment. All studies were conducted on adults aged 45-75 years.

Intervention Characteristics
In this review, the prone position is given by resting the patient in bed in a prone position for not less than 2 hours in the morning, not less than 2 hours during the day, and not less than 6 hours at night, for a total of 10 minutes –14 hours per day.

Results and Discussion
A number of studies in this study yielded benefits from the prone position in COVID 19 patients with mild symptoms that can improve hypoxia and shorten the duration of hospitalization [9-12]. Prone position in patients with hypoxaemia due to COVID-19 reduces the incidence of treatment failure and the need for intubation [13].

Table 2: Summary of Literature Search Results

Author	Result
(Liu et al., 2021)	Treatment in the prone position early can correct hypoxia and shorten the time in the prone position and the duration of hospitalization in mild COVID-19 patients. This is a potential intervention that can be applied clinically.
(Engerström et al., 2022)	During the first three waves of the COVID-19 pandemic, almost half of Sweden's patients were treated with prone ventilation. We found no association between initial use of the prone position and survival in mechanically ventilated patients with severe hypoxemia on ICU admission. To fully elucidate the effect and timing of prone ventilation in critically ill patients with COVID-19
(Xu et al., 2022)	The prone position increases SpO2 in patients with mild or moderate COVID-19. It can also reduce the percentage of mild or moderate patients who develop into severe or critical patients. The application of the prone position is a simple, feasible, safe and effective method of treatment in such patients.
(Umbrello et al., 2022)	Unlike the prone position, chest wall loading had no effect on respiratory system compliance, gas exchange, or alveolar dead space in an unselected cohort of critically ill patients with C-ARDS. Only patients with low respiratory system compliance experienced an increase, with a higher response the lower the baseline compliance.
(Altinay et al., 2022)	Adoption of the prone position in patients receiving non-rebreather mask oxygen therapy for respiratory failure due to COVID-19 pneumonia improves oxygenation and reduces the need for intubation and mortality.
(Ehrmann et al., 2021)	The prone position in patients with hypoxemic respiratory failure due to COVID-19 reduces the incidence of treatment failure and the need for intubation without warning signs. These results support the routine prone position of patients with COVID-19 who require support with a high-flow nasal cannula
(Rosén et al., 2021)	The prone positioning protocol increased the duration of the prone position, but did not reduce intubation rates in patients with hypoxemic respiratory failure due to COVID-19 compared with standard care.

(Wendt et al., 2021)	In a patient with 2019 coronavirus disease who is conscious and spontaneously breathing, initially low pulse oximetry readings improve in the prone position. Further studies are needed to determine the relationship between prone position and subsequent endotracheal intubation and mortality
(Kaya et al., 2022)	We demonstrated that the condition of patients with emergent variant (PEV) was more severe than patients with the original variation (POV) at the time of ICU admission. However, the prone position and steroids were not efficient in increasing the P/F ratio. The PEV P/F ratio was significantly lower in non-invasive ventilation. These results suggest that early intubation may be necessary for PEV
(Lucchini et al., 2022)	An extended prone position is feasible and can reduce the workload on healthcare workers without a significant increase in complications associated with the primary prone position.
(Morales-Quinteros et al., 2022)	The findings of the PRONELIFE study have the potential to change the clinical management of patients who may require invasive ventilation due to acute hypoxemic respiratory failure
(Okin et al., 2022)	The prolonged prone position (PPV) strategy was not associated with overall PPV-related complications although patients receiving PPV experienced increased rates of facial edema and lower rates of peri-proning hypotension. Among intubated COVID-19 patients who received PPV, prolonged PPV was associated with reduced mortality. Prolonged PPV is associated with fewer pronation and supination events and a slightly increased degree of facial edema. These findings suggest that prolonged PPV is a safe and effective strategy to reduce mortality in intubated COVID-19 patients.

Awake Prone Position (APP)

Coronavirus disease- 2019 (COVID-19) is an infectious disease caused by acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Persistent hypoxaemia is a common presentation in patients with severe COVID-19 [2] . Administration of Awake prone position (APP) therapy to non-intubated, spontaneously breathing patients with hypoxemic respiratory failure has been widely used in the health care system which is starting to be overwhelmed due to the increasing number of COVID-19 cases. Prone position improves breathing mechanisms and gas exchange in patients who are not spontaneously intubated and who are mechanically intubated. This increases lung volume, increases the ventilation perfusion ratio and distributes pleural pressure more evenly [14]. Several studies have reported increased oxygenation during APP in a large proportion of patients with hypoxemic respiratory failure due to COVID-19 pneumonia. Implementation of the APP protocol itself is carried out in patients who are not intubated by targeting at least 16 hours of APP per day. Prone and semi-prone positions are allowed according to the patient's condition during the protocol. The supine position is not recommended as it will confound the results of the study and

patients are instructed to position themselves in a semi-recumbent or lateral position between proning sessions. When the patient is in the inter-hospital referral process, it is still allowed to use additional oxygenation with a face mask and the appropriate position for adequate monitoring and safety. The results of giving the prone position treatment to COVID-19 patients without intubation can improve oxygenation and is associated with a decrease in mortality, although it does not reduce the rate of endotracheal intubation [14].

In the results of another study, the term PRone positive study in patients with spontaneous ventilation and acute hypoxemic respiratory failure (PRONELIFE) was found, namely a pragmatic study that compared standard care in the prone position versus standard care without the prone position in patients with acute hypoxemic respiratory failure from any cause. PRONELIFE is one of the first clinical trials of the prone position in patients with acute hypoxemic respiratory failure that will recruit a sufficient number of patients to test the hypothesis that this intervention prevents tracheal intubation. From the results of identification using PRONELIFE it was found that the prone position is an interesting intervention for several reasons. First, many patients with hypoxemic acute respiratory failure appear to tolerate the prone position relatively well. The prone position is also associated with some complications. Data is limited, but so far no severe side effects have been described. PRONELIFE results have the potential to change clinical practice in terms of how to manage patients with acute hypoxemic respiratory failure. PRONELIFE is strong enough to test the hypothesis that the prone position is beneficial for ICU patients with acute hypoxemic respiratory failure [15].

In the case report, a 68 year old patient with acute respiratory failure total failure due to COVID-19 received APP treatment with nasal high flow supplemental oxygenation for 16-18 hours daily. The PaO2/FiO2 ratio increased from 100 to 150 to 250, and no intubation was required for 4 days. Additionally, the patient's ability to participate in physiotherapy, make phone calls with family, and receive oral nutrition was highlighted as a significant advantage.

Chest Wall Loading

As exemplified by the prone position, regional variations in the lung and chest wall provide the possibility to modify transpulmonary pressure and suggest that the clinical application of external pressure to the chest wall may be a useful approach for lung protection. Chest wall loading reduces chest wall compliance, and an increase in driving pressure (or a decrease in respiratory system compliance) is desirable if PEEP and tidal volume do not change provided lung compliance does not increase concomitantly. While such mechanical improvements, due to increased lung expansion, have previously been demonstrated, the application of chest wall loading is rarely attempted in clinical practice. Indeed, a recent report of a patient with late-stage ARDS caused by COVID-19 (C-ARDS) with reduced respiratory system compliance described a so-called "paradoxical" decrease in plateau pressure and increased respiratory system compliance after chest wall compression in the supine position. , and renewed interest in this maneuver. However, no data are available regarding the effect of chest wall loading in patients with reduced respiratory system compliance or in the early phase of the disease. Chest wall loading effects are seen in gas exchange, death space, and the mechanical properties of the respiratory system during the supine and prone positions. Briefly, neither oxygenation nor respiratory system compliance is

altered in the supine position. Both are increased during the prone position and are unaffected by Chest wall loading in the prone position. Alveolar death space does not change. The effect of chest wall loading on respiratory system compliance, PaO2/FiO2 and alveolar death space was not statistically different between patients enrolled in early or late phase C-ARDS [16].

Conclusion

Despite the controversy regarding its effectiveness, the awake prone position is still the first choice for therapy in COVID 19 patients with ARDS. While the prone position resulted in improved oxygenation and mechanics in all patients, chest wall loading had no effect on respiratory system compliance, gas exchange or alveolar death space [17-20].

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