

PRONE POSITION IN PATIENTS WITH RESPIRATORY DISTRESS SYNDROME CAUSED BY CORONAVIRUS: Integrative Review

POSIÇÃO PRONA EM PACIENTES COM SÍNDROME DA ANGÚSTIA RESPIRATÓRIA CAUSADA PELO CORONAVIRUS: Revisão integrativa

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Abstract: Introduction: Among some strains of Coronavirus with already known respiratory repercussions, Coronavirus 2 is the most recently discovered. The first case described occurred in China, in the city of Wuhan, and in January 2020 it was already described as a health emergency internationally. **Objective:** To evaluate how the management of the prone position improves the clinical picture of patients with SARS-CoV-2. **Methodology:** This is a bibliographic study of the integrative literature review type, carried out in the databases: Web of Science and National Library of Medicine, Scientific Electronic Library Online and Physiotherapy Evidence Database between the years 2017 to 2021, using the descriptors Coronavirus infections AND Prone position, and Prone position AND Respiratory Distress Syndrome, Adult. **Results:** A total of 547 articles were found and, after analyzing the title, 69 were included because they approached the theme. After a complete reading of the material, 24 works were selected because they fit the purpose of the study. **Conclusion:** Prone position therapy is proven effective in critically ill patients with Covid-19, however, it does not make it applicable to every patient. It is inferred that there is a need for greater consensus regarding the use of the prone position in patients with mild Covid-19, in order to prevent intubation.

Keywords: Ventral decubitus; Coronavirus; Severe Acute Respiratory Syndrome; Intensive Care Units.

INTRODUCTION

Among some strains of coronavirus with already known respiratory repercussions, Coronavirus 2 is the most recently discovered⁽¹⁾. The first case described occurred in China, in the city of Wuhan⁽²⁾, and in January 2020 a statement by the World Health Organization (WHO) proved the transmission of a new virus, entitled coronavirus 2, from severe acute respiratory syndrome (Sars-CoV-2). Finally, by the end of the same month it was already described as an international health emergency⁽³⁾. Since then, the whole world scenario has changed. It was identified that the novel coronavirus has a high rate of transmissibility and has several symptoms, which can vary from individual to individual, even presenting itself in asymptomatic form⁽⁴⁾.

With regard to symptoms, those described as mild are portrayed by the presence of cough, fever, fatigue and muscle pain, and this clinical picture is the most common in the population⁽¹⁾. However, on average 15% of infected patients develop the severe form of the disease^(1,5) and a portion of these individuals progress to hospitalization in Intensive Care Units (ICU). Among the management strategies to improve the clinical picture in ICU patients, the prone position has often been used. The prone position is characterized by, unlike what is commonly used, positioning the patient in ventral decubitus⁽⁶⁾.

Recent WHO data state that by April 2021 coronavirus deaths already exceeded the number of 3 million deaths⁽⁴⁾. Given the novelty of the current epidemic, there are many questions regarding the better management of critically ill patients with COVID-19, in order to reduce their morbidity and mortality. In view of this, the present study aimed to evaluate how the management of the prone position improves the clinical picture of patients with SARS-CoV-2 in Intensive Care Units.

METODOLOGY

This is a bibliographic study of the integrative review type, carried out in the databases International Literature in Health and Biomedical Sciences (PubMed/ MEDLINE), Online Electronic Scientific Library (SciELO), Physiotherapy Evidence Database (PedRO), between the years 2017 and 2021. The PubMed and SciELO databases were chosen due to their robustness of material, while PedRO was selected because it is specific to physiotherapy. Although the novel coronavirus 2 was discovered in 2019, this study covered two previous years, so that acute respiratory distress syndrome could be contrasted and differentiated with the current one, caused by COVID-19.

The study took place during the period from April 2021 to June 2021. After being reformulated

by the DeCS (Health Sciences Descriptors) library, the descriptors were used in an associated way: Coronavirus infections AND Prone Position and Prone Position AND Respiratory Distress Syndrome, Adult. The inclusion criteria were studies in English and Portuguese published in the last five years, with patients diagnosed with Covid-19 who used the prone position as an intervention. As for the exclusion criteria, studies in which more than one positioning and patients with other chronic respiratory conditions were excluded.

A total of 552 articles were found - PubMed (543), SciElo (9) and PeDRO (0). The evaluation of the studies was carried out by the title and abstract in the first instance. Of these, 69 were included because they fit the theme, the others were excluded because they were from other reviews and because they associate other positions. In order to narrow down the research, after the complete reading of the material, 18 were selected because they are even more equivalent to responding to this study proposal. In order to visually facilitate the methodological proposal trodden, the flowchart of the study will be presented below. (Figure 1).

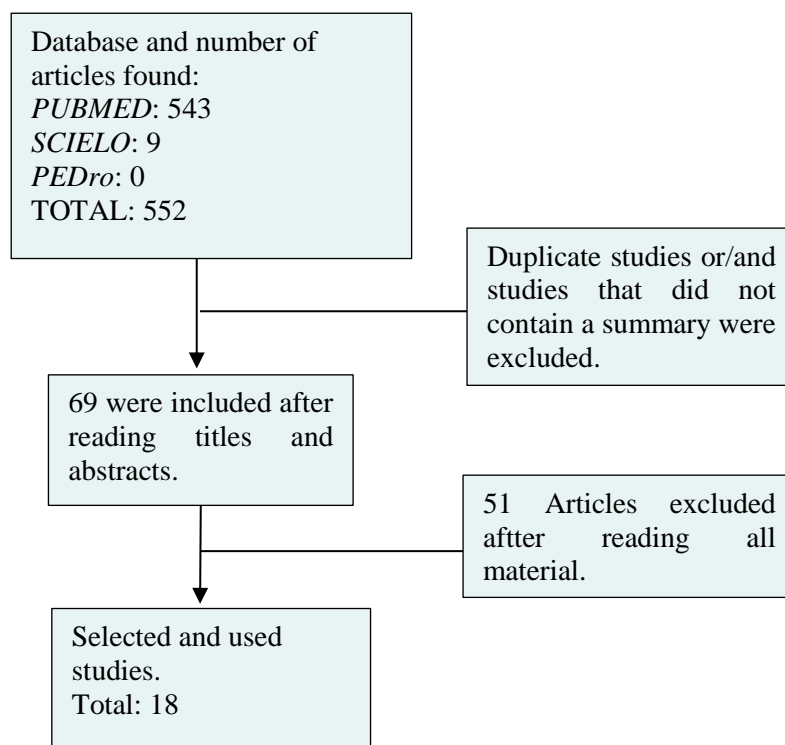


Figure 1 – Flowchart of the included articles. Cachoeira, Bahia, Brazil, 2021.

RESULTS

The articles were critically analyzed and discussed among the authors the relevance of their

contribution to this study. The material resulted in a final sample of 18 studies (Table 1).

Table 1 – Description of the included articles. Cachoeira, Bahia, Brazil, 2021.

Author (s) / Agr	Title	Research Methodology	Conclusion
Ng JA, <i>et al.</i> , 2020	Prone positioning of patients with COVID-19-related acute respiratory distress syndrome: A team in prone position based on rehabilitation.	Case Report	The establishment of a team prepared to carry out the pronation and with experience in the intensive care unit of this case report serves as a guide for the implementation of the maneuver in other institutions.
Coppo A, <i>et al.</i> , 2020	Feasibility and physiological effects of prone positioning in non-intubated patients with acute respiratory failure due to COVID-19 (PRON-COVID): a prospective cohort study.	Prospective cohort study	Prone positioning in awake and spontaneously breathing patients was effective in the intensive care unit in most of the sample.
McNicholas B, <i>et al.</i> , 2020	Prone positioning in acute respiratory failure of COVID-19: simply do it?	Revisão do escopo	There is not enough evidence of the use of prone positioning in awake patients with hypoxemic respiratory failure caused by Covid-19.
Araújo MS, 2021	Prone positioning as an emerging tool in the care provided to patients infected with COVID-19: a review of the scope.	Scope Review	Among the outcomes, the positive results seem to stand out from the negative ones with regard to the use of the prone position in patients with acute respiratory failure due to Covid-19, with reduced mortality.
Wiggermann N, 2020	Patients with pronation with COVID-19: A review of equipment and methods.	Literature Review	Pronation improves blood oxygenation and survival rates.
Munshi L, 2017	Prone Position for Acute Respiratory Distress Syndrome. A systematic review and meta-analysis.	Systematic Review and Meta-analysis	The prone position of at least 12 hours a day possibly reduces mortality in patients with Adult Respiratory Distress Syndrome (ARDS).
Carsetti A, 2020	. Prolonged ventilation in the prone position for patients with SARS-CoV-2 is feasible and effective	Cohort Study	Prone positioning can possibly be applied above 16 hours to patients with SARS-CoV-2.
Wei TAN, <i>et al.</i> , 2021.	The efficacy and tolerance of prone positioning in non-intubated patients with acute hypoxemic respiratory failure and ARDS: a meta-analysis.	Meta-analyses	The intubation rate of patients with AHRF and ARDS was 33% and 4% mortality; and with regard to patient intolerance, 7%. Prone positioning could improve the oxygenation and respiratory rate of these patients.

Venus K, Munshi L, Fralick M. 2020.	Prone positioning for patients with hypoxic respiratory failure related to COVID-19.	Literature Review	Prone Posing is effective in ARDS as studies have already proven. However, positioning in non-intubated patients, although attractive because it is simple, does not seem to offer a solid foundation.
Cardona S, <i>et al.</i> , 2021	Intubation rate of patients with hypoxia due to COVID-19 treated with agreed pronation: a meta-analysis.	Meta-analysis	The study showed an intubation rate of 28% in hypoxic patients with COVID-19 undergoing the prone position (PP) on standby. Awake PP in COVID-19 is feasible and practical, and more rigorous research is needed.
Klaiman T, <i>et al.</i> , 2021	Improving prone positioning for severe acute respiratory distress syndrome during the COVID-19 pandemic: An implementation mapping approach.	Qualitative Study	A good evidence-based implementation of face-to-need positioning for severe ARDS, an effective and proven life-saving treatment administered to a minority of eligible patients.
Flynn Makic MB, 2020	Prone position of patients with COVID-19 and acute respiratory distress syndrome.	Book or Newspaper Chapter	The evidence supports the placement of patients in ventral decubitus at the beginning of ARDS management to improve patient survival.
Petrone P, Brathwaite CEM, Joseph DK, 2020	Prone ventilation as a treatment for COVID-19-related acute respiratory distress syndrome.	Literature Review	Prone positioning should be considered at the beginning of the ARDS course due to COVID-19 and be used until there is an improvement in gas exchange, mechanics and general clinical course.
Gleissman H, <i>et al.</i> , 2020.	Prone positioning in mechanically ventilated patients with severe acute respiratory distress syndrome and coronavirus disease 2019.	Case Series	Proning increased PaO ₂ : FiO ₂ , especially in patients with PaO ₂ : FiO ₂ approximately <120 mm Hg, with consistency over three sessions. Pronation can be considered in most patients.
Taboada M, <i>et al.</i> , 2021	Effectiveness of prone positioning in non-intubated intensive care unit patients with moderate to severe acute respiratory distress syndrome due to coronavirus disease 2019.	Prospective Observational Study	PP improved oxygenation in ICU patients with moderate or severe COVID-19 and ARDS. PP was relatively well tolerated in patients and can be a simple strategy to improve oxygenation.
Berrill, M. 2021	Evaluation of oxygenation in 129 pronation sessions in 34 mechanically ventilated patients with COVID-19.	Retrospective Analysis	In the context of Covid-19 and hypoxemia, prone positioning has improved oxygenation. Further studies, including prospective studies and controlled trials, on the relationship between the impact of prone positioning

			on mortality are therefore needed.
Kimmoun A, <i>et al.</i> , 2020	Usefulness and safety of a team dedicated to patients in ventral decubitus with severe ARDS due to COVID-19.	Retrospective Observational Study	Since the pathophysiology is poorly understood, the specific role of PP among the ideal treatment for patients with COVID-19 with ARDS, in order to reduce mortality, needs to be addressed.
Scaramuzzo G, <i>et al.</i> , 2021.	Sustained improvement in oxygenation after first prone positioning is associated with the release of mechanical ventilation and mortality in critically ill COVID-19 patients: a cohort study.	Cohort Study	Sustained improvement in oxygenation after the first PP session is independently associated with improved survival and reduced duration of mechanical ventilation.

Source: Prepared by the authors.

DISCUSSION

From the analysis of the selected material, three agenda nuclei emerged: Nucleus 1 - Physiological way in which prone positioning improves the clinical status of patients; Nucleus 2 - Applicability of the prone position in patients with mild or severe cases of Covid-19; and Nucleus 3 - Difficulties in implementing the prone position.

Core 1 – Physiological way with the prone position improves the clinical condition of patients

It is believed that the physiological mechanism by which the Prone Position (PP) helps stabilize patients with Adult Respiratory Distress Syndrome (ARDS) due to Covid-19 is the one commonly identified in the common ARDS. Some of its effects include homogenization of pulmonary areas, reduction of shunt zones, consequently improvement of perfusion⁽⁷⁾, in addition to the very action of gravity that, in the patient in ventral decubitus, displaces secretion^(8,21), allowing greater alveolar recruitment in the dorsal region and improving ventilation⁽⁶⁾.

During the pronation period, the heart distances itself from the lung and the left inferior vena cava moves away enough away to favor venous return. Thus, the hemodynamic benefit caused by pronation would be justified⁽⁹⁾. According to studies, the prone position is one of the most efficient strategies for patients with severe ARDS due to covid, as it improves oxygenation and perfusion; consequently, it improves the elastance of the chest wall^(10,11). By putting the patient in pronation, ventilation and perfusion (V/Q) that were previously dependent are really improved, causing it to reduce intrapulmonary shunt and favor more effective oxygenation⁽⁹⁾. A prospective observational

study reports that patients with moderate or severe ARDS due to COVID-19 achieved benefits of improved oxygenation when undergoing pronation cycles, demonstrating the similarity between ARDS and the pathophysiology of COVID-19⁽¹²⁾. However, for some authors, not all patients maintain the improvement in oxygenation after returning to the supine position⁽¹³⁾. In addition, the way the position is carried out is fundamental to a successful result. Thus, for the maneuver to be effective, it is necessary that it be performed properly by a trained team, that there is greater interaction between the ICU team and the bedside team to turn patients safely, in order to reduce mortality^(14,15,23).

Core 2 – Applicability of the prone position in patients with mild of severe covid-10 conditions

Among the patients admitted to the ICU, some remain with the use of non-invasive ventilation while others, in severe cases, progress to intubation. In view of this fact, the applicability of prone positioning needs to be differentiated in patients with mild, moderate and severe conditions. Studies show that the use of the prone position applied to moderate to severe ARDS is proven effective^(8,15,22) and the WHO has recognized its effectiveness by being used within the 12 to 16-hour window. Currently, its correlation has been made with patients with Covid-19 who have critical cases of the disease, and evolves to ARDS, using evidence based on common ARDS. Studies indicate that the use of the prone position in patients intubated with moderate to severe ARDS due to Covid-19 were beneficial for these patients⁽¹⁶⁾, with improvement in the V/Q ratio.

However, with regard to the use of the prone position in non-intubated patients breathing spontaneously or the use of supplementary oxygenation, in order to prevent intubation, opinions still seem to differ. Some studies describe that this procedure can improve the ventilation of these patients and possibly prevent intubation, but recognize that this measure can also only be a delay in intubation. In a study conducted with 56 patients on non-invasive Continuous Positive Airway Pressure (CPAP) or oxygen therapy, they underwent at least 3 hours of pronation and it was identified that 47 of the patients responded positively to the positioning. However, the authors themselves report that there is a loss of the effect after switching to bench press⁽⁶⁾. In this case, PP seems to stand out in severely affected patients, acting as a rescue maneuver, in view of the urgency of improvement, while in less aggravated patients the short-lasting effect of pronation is more evident^(14,19).

It is worth noting that prone positioning in awake patients should not simply be performed, even if the risks are minimal for this patient. Since there is no scientific basis for this⁽¹⁷⁾ and the improvement in oxygenation, it risks not being the key predictor to avoid invasive ventilatory support, in addition to reducing the effects after resupination⁽⁹⁾. To date, most studies that relate prone positioning in non-invasively ventilated patients are observational or cohort studies, so there is no

significant sample as in randomized clinical trials that prove the effectiveness of the use of the maneuver⁽¹⁸⁻¹⁷⁾.

Core 3 – Difficulties in implementing the prone position

Much of the procedure performed in a hospital environment involves risks, to a lesser or greater extent; and in the prone position it is no different. To perform the manual maneuver, five or seven health professionals are requested⁽⁸⁾, requiring careful management, thus avoiding displacement of tubes, probes or any apparatus that the patient makes use of⁽¹²⁾.

The team needs to be prepared and safe from both positioning management and other complications, such as hemodynamic instability⁽⁷⁾. This requirement, for some authors, makes it difficult to position, given that this amount of qualified personnel is scarce and can still cause congestion in the flow of care, constituting an obstacle in the effectuation of the change of decubitus^(8,16,20).

CONCLUSION

The prone position is often used as a rescue maneuver in patients with ARDS and, currently, has also been used in ARDS caused by Covid-19. The mechanism of action that occurred after this change in decubitus is associated with several factors, including the improvement in the ventilation/perfusion (V/Q) ratio seems to receive a special highlight. Among the patients most benefited by the maneuver are those admitted to ICUs with critical repercussions of Covid-19, its use in patients with mild repercussions or spontaneous breathing, in order to avoid intubation. Although safer, the method still seems to diverge opinions. In addition, with regard to the applicability of the decubitus change, the hemodynamic risks involving the technique, as well as the limited amount of staff, are presented as some limiting factors for prone positioning.

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