BENEFITS OF PRONE POSITION COMPARED TO BACK DECUBIT IN ADULTS/ELDERLY PEOPLE HOSPITALIZED IN INTENSIVE MEDICINE SERVICES FOR COVID-19 AND IN INVASIVE MECHANICAL VENTILATION: A SCOPING REVIEW

Ana Margarida Sequeira Silvestre
https://orcid.org/0000-0001-9167-9300

Ana Rita Moreira Cardoso
https://orcid.org/0000-0001-8376-2809

Lara Catarina Macedo da Silva
https://orcid.org/0000-0002-9371-5501

Mariana Poutena Santos
https://orcid.org/0000-0003-3968-5505

Mariana Machado Teixeira
https://orcid.org/0000-0001-7532-7591

João Filipe Fernandes Lindo Simões
https://orcid.org/0000-0002-4989-2252

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).
**Abstract:** Prone Position (PP) is widely used in patients diagnosed with Acute Respiratory Distress Syndrome (ARDS), positive for COVID-19, under Invasive Mechanical Ventilation, in order to improve oxygenation/ventilation and reduce mortality. This technique is quite used in Intensive Care Units in alternation with the Dorsal Position (PD). This Scoping Review aims to analyze parameters such as: PaO2/FiO2 ratio, pulmonary compliance, atelectasis/dead space, ARDS severity, PP time and mortality rate, in both positions, in order to verify the benefits of PP relatively to PD existing in the literature. Data collection was performed in the following databases: PubMed, Scopus, Web of Science and Google Scholar. The eligibility criteria were defined as: articles published between 2020 and 2022, with full text and in Portuguese and English, resulting in a total of seven articles. There were no significant differences in the following parameters: lung compliance, atelectasis/dead spaces, ARDS severity and mortality rate. As for the time of PP, it was found that there was unanimity (average of 16 hours per day); and that the PaO2/FiO2 ratio, for the most part, improved during PP compared to PD, which allows for an improvement in the efficiency of oxygenation/ventilation. Thus, it is possible to conclude that the increase in the PaO2/FiO2 ratio is the indicator in which the best benefits are observed. It is suggested that other studies be carried out, with specific criteria, so that other more concrete evidence can be described.

**Keywords:** COVID-19, Mechanical ventilation, Prone position, Intensive care, Dorsal position.

**INTRODUCTION**

Intensive Care Units (ICUs) are units “qualified to assume full responsibility for users with organ dysfunctions, supporting, preventing and reversing life-threatening failures” (Ordem dos Enfermeiros, 2018). It is in the ICUs that critical users who need constant and differentiated monitoring and care are found. These places must be qualified to assume full responsibility for users with organ dysfunctions, supporting, preventing and reversing failures with vital implications (Ministry of Health & DGS, 2013).

The COVID-19 pandemic, which emerged at the end of 2019 (SNS 24, 2022), caused by the new coronavirus SARS-COV-2, can cause severe respiratory infection such as pneumonia. It intends to progress to Acute Respiratory Distress Syndrome (ARDS) (Bell et al., 2022; Scaramuzzo et al., 2021), which according to Fanelli et al. (2013) is a clinical syndrome characterized as an acute inflammatory process associated with lung injury, increased vascular permeability, reduced ventilated lung tissue with subsequent onset of acute dyspnea (Costa, D., 2020). The main tenets of ARDS are considered to be: hypoxemia, decreased pulmonary compliance and pathological features of alveolar lysis (hemorrhages, edema and atelectasis.) (as cited in Menk et al., 2020). These conditions lead to hospitalization and treatment with Invasive Mechanical Ventilation (IMV) of 10 to 20% of infected patients (Bell et al., 2022).

Concomitantly with IMV, the Prone Position (PP) has been used in alternation with the Dorsal Position (PD). PP consists of changing the user’s decubitus so that he is in a ventral position. So far, in the literature, there has not been a protocol for its application (Stilma et al., 2021; Chua et al., 2021), however the decision to opt for PP is a medical one, according to specific criteria, such as: PaO2/FiO2 ratio < 150 mmHg (severe ARDS cases); Positive End Expiratory Pressure (PEEP) > 5 cmH2O; FiO2³0.6 (Stilma et al., 2021; WHO, 2021).

PP is used for its effect on improving
oxygenation and decreasing the mortality rate (Gattinoni et al., 2013). These improvements are possible, given that there is greater thoracic expansion and, consequently, oxygenation of the dorsal areas of the lung (Langer et al., 2021). There is also a redistribution of ventilation in areas with good perfusion, resulting in a reduction in atelectasis (Scaramuzzo, et al., 2021) and can reduce stress and tension associated with IMV, reducing the risk of lung injuries associated with ventilation. There are hospitals that during the pandemic developed their own protocols (Chiu et al., 2021; Shelhamer et al., 2021) and describe the need for a multidisciplinary team of at least five to six qualified health professionals (Guérin et al, 2020; Langer et al., 2021).

Considering this problem, it was decided to carry out a Scoping Review, with the following research question: “What are the benefits of the Prone Position compared to the supine position in adult/elderly users, positive for COVID-19 and on invasive mechanical ventilation, hospitalized in Intensive Medicine/Intensive Care services?” constructed using the PICO methodology. Thus, the objective of this review is to demonstrate the effectiveness and benefits of PP compared to PD, in patients positive for COVID-19, undergoing IMV.

**METHODOLOGY**

The present Scoping Review followed the methodology proposed by Lockwood et al. (2022), Sousa et al. (2017) and Souza et al. (2010), with the objective of identifying the available evidence in response to the research question, following the PICO strategy (Population, Intervention, Context and Outcomes) (Munn, Z., 2021). For each of these requirements, one or more descriptors were defined according to Table 1. As specific objectives, the ventilatory parameters are analyzed, such as: PaO2/FiO2 ratio, pulmonary compliance and atelectasis/dead space; the severity of ARDS; PP time and mortality rate, in both positions, in order to support the initial objective.

The search was carried out in four electronic databases: PubMed, Scopus, Web of Science and Google Scholar; following a search strategy for articles indexed with Medical Subject Headings (MeSH) and Health Sciences Descriptors (DeCS) on par with the Boolean expressions OR and AND.

With the support of the Rayyan operating system, the articles were uploaded and the number of duplicate articles was tracked (16). Articles from quantitative studies and mixed design studies were considered; published between 2020 and 2022, in English and Portuguese, available in full text, and which had as inclusion criteria: age over 18 years, positive COVID-19 and under IMV; and exclusion: not allusive to the theme; type of study/document (pamphlets, symposium documents, theses, books, literature reviews, among others), does not address prone position, only addresses dorsal position and only addresses prone position.

This search strategy resulted in a total of 277 articles after deduplication. After reading their titles and abstracts, 7 articles were selected for full text review, of which 7 met the eligibility criteria defined above. Their bibliographic references were consulted to identify possible additional articles of interest to the topic, based on the relevance of their title, and no additional article was selected. The final sample resulted in a total of 7 articles, which were submitted to quality assessment following the analysis guidelines of Kmet et al. (2004). This was carried out by two reviewers, independently, and later, the scores obtained were compared (Table 2). Documents with a score greater than 0.75 were included in the Scoping Review, resulting in a total of 7 studies. The process of identification, selection, eligibility and inclusion of articles followed
Table 1: PICO method and DeCS and MeSH descriptors used in the literature review.

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Reviewer 1</th>
<th>Reviewer 2</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parker et al. (2021)</td>
<td>0.86</td>
<td>0.90</td>
<td>Included</td>
</tr>
<tr>
<td>Langer et al. (2021)</td>
<td>0.78</td>
<td>0.8</td>
<td>Included</td>
</tr>
<tr>
<td>Stilma et al. (2021)</td>
<td>0.95</td>
<td>1</td>
<td>Included</td>
</tr>
<tr>
<td>Scaramuzzo et al. (2021)</td>
<td>0.95</td>
<td>1</td>
<td>Included</td>
</tr>
<tr>
<td>Taenaka et al. (2021)</td>
<td>1</td>
<td>0.75</td>
<td>Included</td>
</tr>
<tr>
<td>Rossi et al. (2022)</td>
<td>0.85</td>
<td>0.85</td>
<td>Included</td>
</tr>
<tr>
<td>Bell et al. (2022)</td>
<td>0.95</td>
<td>0.95</td>
<td>Included</td>
</tr>
</tbody>
</table>

Table 2: Results of the evaluation of the quality of articles according to the analysis guidelines of Kmet et al. (2004)

Figure 1: Research flowchart (PRISMA).
the PRISMA flowchart recommended by Moher et al. (2009) (Figure 1).

Then proceeded to the extraction of data including the identification of the article, type of ARDS, duration of PP, parameters evaluated, effects of PD, effects of PP and conclusions (Table 3).

**RESULTS**

**GENERAL CHARACTERIZATION OF STUDIES**

All included studies were found to be quantitative studies, of which three are retrospective observational studies (case-control study) (Parker et al., 2021; Bell et al., 2022; Langer et al., 2021), three analytical observational studies (Stilma et al., 2021; Scaramuzzo et al., 2021; Rossi et al., 2022) and a case study (Taenaka et al., 2021).

Study users are adults over 18 years of age, admitted to ICU, diagnosed with mild to severe ARDS, associated with COVID-19, under IMV. Furthermore, the users were submitted at least once to the alternation from PD to PP. The sample size ranged from 20 to 1057 users, with the exception of the study by Taenaka et al. (2021) which only includes 2 users.

**EFFECTS OF PRONE POSITION COMPARED TO BACK POSITION**

Oxygenation and mortality are two of the parameters described that benefit from the application of PP in patients with COVID-19 under IMV (Parker et al., 2021). The main parameters referred to in the articles included in this review are: perfusion and gas exchange (PaO2/FiO2 ratio and resupination cycles), mechanical ventilation parameters (compliance, atelectasis), ARDS severity, PP time and associated mortality. Next, each of these parameters is explored.

**PERFUSION PARAMETERS AND GAS**

**EXCHANGE**

- PaO2/FiO2 ratio

  Parker et al. (2021), Scaramuzzo et al. (2021), Taenaka et al. (2021) and Bell et al. (2022) report that after using PP, there is an increase in the PaO2/FiO2 ratio, compared to PD. More specifically, the article by Scaramuzzo et al. (2021) presents, before the PP, values of the PaO2/FiO2 ratio of 101 (80 - 127) mmHg in the “responders” users and of 105 (90 - 130) mmHg for the “non-responders”. After the PP, they found that there was an increase in the values in all users, but the best response was found in the “responders” users, with an increase in the PaO2/FiO2 ratio to 210 (161-276) mmHg, while the “non-responders” presented PaO2/FiO2 ratio values of 127 (100 - 150) mmHg.

  In the study by Taenaka et al. (2021), in which users are subjected to IMV with low and high PEEP, in both positions, it appears that there is an increase in the PaO2/FiO2 ratio after PP. The PaO2/FiO2 ratio values are higher when a high PEEP value is applied (230 mmHg dorsal and 255 mmHg in prone with high PEEP vs 166 mmHg in dorsal and 176 mmHg in prone with low PEEP) - case 1. In case 2, with low PEEP, there are significant improvements in the PaO2/FiO2 ratio, with an increase from 243 mmHg in PD to a value of 495 mmHg in PP. When PEEP increases, they report a decrease in oxygenation and in the PaO2/FiO2 ratio, compared with low PEEP; however, PP, with high PEEP, reveals a higher PaO2/FiO2 ratio (436 mmHg) compared to PD (196 mmHg). For Bell et al. (2022), the PaO2/FiO2 ratio improved by 19% after PP.

  As for Langer et al. (2021), in a first analysis, mentions that the PaO2/FiO2 ratio decreases when positioned in PP, which can be explained by the high number of patients diagnosed with severe ARDS, with indication for PP. In a second study, with 78 users, they found that the ratio increased.
<table>
<thead>
<tr>
<th>Author</th>
<th>ARDS type</th>
<th>Prone position duration (PP)</th>
<th>Evaluated parameters</th>
<th>Dorsal position effects</th>
<th>Prone position effects</th>
<th>conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parker et al. (2021).</td>
<td>moderate to severe</td>
<td>1, 7, 12, 24, 32 and &gt; 39h, 51 and 93h</td>
<td>PaO2/ FiO2 ratio, compliance, PP Duration, Mortality, Time under VMI</td>
<td>Prior to PP(initial PD): * Lower PaO2/FiO2 ratio (130 mmHg). repronning: * Decreased PaO2/FiO2 ratio compared to PP. PD alternating with PP: * Initial PD - PaO2/FiO Ratio_lower (141 mmHg); * Resupination - PaO2/FiO2 ratio gradually decreased. 2nd Resupination (7h): * Constant increase in PaO2/FiO2 Ratio.</td>
<td>proneprolonged (&gt;39h): * Improvement in PaO2/FiO Ratio_(170-198 mmHg); Reproning: * PaO2/FiO2 ratio increases at 51 and 93 h. PP alternating with dorsal: * 1st PP - improvement in the PaO2/FiO Ratio (188-208 mmHg); * reproof - PaO2/FiO2 ratio increased (195-199 mmHg).</td>
<td>In the use of Prolonged PP, an improvement in oxygenation was evidenced by the increase in the PaO2/FiO2 ratio in PP when compared to the initial position of PD, from 18:00 onwards. The repetition of the PP demonstrates a higher PaO2/FiO2 ratio, compared to the prolonged PP. In patients who underwent a PP alternating with PD, it was found that repron is not necessary to improve oxygenation, maintaining a PaO2/FiO2 ratio identical to that of the initial PD. Pulmonary compliance does not show significant differences.</td>
</tr>
<tr>
<td>Stilma et al. (2021).</td>
<td>Mild, moderate and severe</td>
<td>Average of 15h/ day</td>
<td>Mortality at 28 and 90 days.</td>
<td>Population without indication and placed in PD: * Lower mortality compared to those placed in PP (28.6%). Population with indication and placed in PD: * Higher mortality compared to those placed in PP (41.3%).</td>
<td>Population without indication and placed in PP. * Higher mortality compared with those who were kept in PD (31.3%). Population with indication and placed in PP: * Lower mortality compared with patients who were kept on PD (34.1%).</td>
<td>No significant differences in mortality rate at 28 and 90 days. However, it appears that it was lower in users without indication of PP and higher in users with indication, but variables related to the characteristics of the population must be taken into account for the analysis of the results.</td>
</tr>
<tr>
<td>Scaramuzzo et al. (2021).</td>
<td>moderate or severe</td>
<td>16h/day (average)</td>
<td>PaO2/ FiO2 Ratio, Mortality</td>
<td>Users who responded to the initial PP - PD: * PaO2/FiO2 ratio(101 mmHg) Users who did not respond to the PP: * PaO2/FiO2 ratio (105 mmHg)</td>
<td>Users who responder the PP: * Increase ofPaO2/FiO2 ratio(210mmHg) Users who did not respond to the PP: * Slight increase in PaO2/FiO2 Ratio (127 mmHg) * Higher mortality rate.</td>
<td>It analyzes the effects of PP, referring to data before PP and after, in two population groups: those who responded positively to the PaO2/FiO2 Ratio with an increase relative to the population mean; and those who did not respond (decreased PaO2/ FiO2 ratio, relative to the population mean). They found that after PP, in patients classified as “responders”, there was a significant increase in the PaO2/FiO2 ratio, which was associated with shorter IMV time, lower mortality and tracheostomy rates.</td>
</tr>
</tbody>
</table>
| Taenaka et al. (2021). | mild and moderate | AT | PaO2/FiO2 Ratio, Pulmonary Compliance, Dead Space | Case 1: Low PEEP:  * Lower PaO2/FiO2 ratio (166 mmHg);  * Largest dead space (28%).  
High PEEP:  * Lower PaO2/FiO2 ratio (166 mmHg);  * Largest dead space (11%). | Case 2: Low PEEP:  * Lower PaO2/FiO2 ratio (243 mmHg);  * Largest dead space (17%).  
High PEEP:  * Less dead space (10%);  * Lower PaO2/FiO2 ratio (196 mmHg). |
|----------------------|------------------|---|-----------------------------------------------|---------------------------------|------------------|
| Rossi et al. (2022). | Mild, moderate and severe | AT | PaO2/FiO2 ratio; atelectasis | In PD:  * Atelectasis at the dorsal level.  
Resupilation:  * Well-oxygenated tissues increase;  * Poorly oxygenated tissue decreased and non-oxygenated tissue decreased significantly;  * Atelectasis decrease;  * Increase in PaO2/FiO2 Ratio (from 129.9 to 147.2 mmHg). | In PP:  * Atelectasis decreases from 13% to 8%;  * Increase in PaO2/FiO2 Ratio (144.3 mmHg);  * Increase in oxygenated tissues of the dorsal regions;  * Atelectasis at the ventral level. |
| Bell et al. (2022). | severe, moderate | Average of 23h/day (14 to 49h/day), interval of on average 12h (5 to 24h) between each pronation | PaO2/FiO2 Ratio, Pulmonary Compliance | PD:  * PaO2/FiO2 ratio of 115 mmHg;  * compliance and pulmonary: 26 ml/cmH2O.  
Return to Back Position:  * Increase in PaO2/FiO2 ratio of 137 mmHg;  * compliance pulmonary: remained the same. | Start PP:  * compliance pulmonary: 27 ml/cmH2O.  
End of PP:  * PaO2/FiO2 ratio increases to 140 mmHg;  * compliance pulmonary: 29 ml/cmH2O. |
| | | | | | PP was associated with an increase in the PaO2/FiO2 Ratio of 19%. There are also improvements in the PaO2/FiO2 ratio right after PP and it is maintained in resupilation. Lung compliance is higher at the end of PP, however without significant variations. The best value of the PaO2/FiO2 Ratio is verified at the end of the PP. These authors mention priority to PP in users whose PaO2/FiO2 ratio is less than 100 mmHg. |

In both cases, PP was effective in improving oxygenation and reducing dead spaces. The combination of high PEEP with PP allows for greater oxygenation, with an increase in the PaO2/FiO2 ratio and a reduction in dead spaces. No significant changes in lung compliance.
| Langer et al. (2021). | Mild, moderate and severe | 1 to 4 sessions, from 16 to 22 hours/day | PaO2/FiO2 Ratio, Pulmonary Compliance, Mortality | PD only:  
* Upper PaO2/FiO2 ratio: 145 (107 to 197 mmHg);  
* Less hospitalization time and fewer days on IMV 10 (6 to 19 days).  
Group of 78 people and 3 evaluation moments:  
  * Resupination slightly lowers the PaO2/FiO2 Ratio: 128 (87 to 174 mmHg), higher than PD 98 (72 to 121 mmHg);  
  * PD – pulmonary compliance (26 to 51) mL/cmH2O | At least once in PP:  
* Lower PaO2/FiO2 ratio: 108 (81 to 148 mmHg);  
* Mortality and length of stay in the upper ICU, with more users with severe ARDS;  
* More days under VMI 16 (10 to 30 days).  
Group of 78 people and 3 evaluation moments:  
  * PP increases PaO2/FiO2 Ratio: 158 (112 to 220) mmHg.  
  * N/A - Not applied; PD - Dorsal Position; PEEP - Positive end-expiratory pressure; PP - Prone Position; ARDS - Acute respiratory distress syndrome; ICU - Intensive Care Unit; VMI - Invasive Mechanical Ventilation.  
Table 3: Summary of results of the studies analyzed in the Scoping Review | The number of users with severe ARDS is higher, which leads to a higher mortality rate (41%). And, it is the majority of users proposed for PP (77%).  
PP is the most frequent option when there is severe ARDS (44%).  
Group 78 users:  
* 78% showed improvements in the PaO2/FiO2 ratio, greater than or equal to 20 mmHg (42 to 117 mmHg).  
PP is an inexpensive procedure and allows to improve the oxygenation of users, by improving ventilation/perfusion. |
Contrary to the first mentioned studies, the article by Rossi et al., (2022) indicates that there were no significant changes in the PaO2/FiO2 ratio, given that 65% of the participants were considered non-responder, Delta PaO2/FiO2 value (difference between prone and PD PaO2/FiO2 ratio) ≤ 20 mmHg; and that 35% had a negative Delta PaO2/FiO2.

· Resupination cycles
Several studies have verified that after resupination there are changes in the parameters of the PaO2/FiO2 ratio, in compliance and in the formation of atelectasis. Parker et al. (2021), Bell et al. (2022) and Langer et al. (2021) found that during resupination there is a decrease in the PaO2/FiO2 ratio when compared to PP. However, there is an improvement when compared to the base values of the first PD. Bell et al. (2022) adds that there is an improvement in oxygenation, but not in compliance.

For Parker et al. (2021), the alternation of decubitus allows to obtain a higher PaO2/FiO2 ratio, being greater during the time of PP in alternation with PD, compared with the prolonged PP (> 39h). However, he also adds that a single repositioning in prolonged PP significantly improves oxygenation.

In the study by Rossi et al. (2022), it was found that after resupination the amount of atelectasis decreased considerably when compared to PD. Well-oxygenated tissues increase, poorly oxygenated tissues decrease, and non-oxygenated tissues decrease significantly. This is demonstrated by the fact that the PaO2/FiO2 ratio increases (from 129.9 to 147.2 mmHg).

As for pulmonary compliance, it increased in PD (after resupination) in the study by Parker et al. (2021) and in Rossi et al. (2022).

MECHANICAL PARAMETERS OF VENTILATION
· compliancepulmonary

In the studies by Bell et al. (2022), Langer et al. (2021) and Taenaka et al. (2021), lung compliance had no significant changes. However, in the article by Parker et al. (2021), it is reported that during the 36-h PP, there is a non-significant gradual increase in respiratory compliance.

In the article by Taenaka et al., (2021), superior pulmonary compliance (28 ml/cmH2O) is reported when the patient in case 1 is positioned in PP and under ventilation with high PEEP. In contrast, the patient in case 2 reveals better lung compliance when in PD under low PEEP (58 ml/cmH2O). For Parker et al., (2021), the lowest value occurs in PD before PP (27 ml/cmH2O), afterwards there is an insignificant increase in it. However, higher values are reached with frequent alteration of decubitus (from dorsal to PP), reaching a value of 38 ml/cmH2O.

· Atelectasis and Dead Spaces
According to the study by Taenaka et al., (2021), with increasing PEEP, the amount of lung dead space decreases, either associated with PP or PD (case 1), and the presence of dead space in the PP position with high PEEP, it has the lowest value (3%). As for case 2, it is shown that with the change of decubitus, in lower PEEP, the dead space decreases from 17% to 8% (dorsal vsprone), in line with what happened with the patient in case 1. However, when there is an increase in PEEP, in PP compared to PD, the dead space increased.

Rossi et al., (2022), describe that when users are positioned in PP, new atelectasis in the ventral region are formed, while dorsal atelectasis, previously present in dorsal position, disappear. This is because in PP, there is an increase in the compression exerted by the weight of the lung in the ventral region and a decompression in the dorsal region. This phenomenon allows for a redistribution of oxygenated tissue.
GENERAL PARAMETERS

- ARDS severity
All the articles under analysis demonstrate the inclusion of users classified, according to the Berlin criteria, by the three types of ARDS severity (mild, moderate and severe), with the exception of Scaramuzzo et al. (2021) and Bell et al. (2022) that only identify patients with moderate and severe ARDS and Taenaka et al. (2021) that included patients with mild and moderate ARDS. The highest percentage of users had severe pathology, followed by moderate and, in a smaller number, mild pathology.

- Prone Position Time
Stilma et al. (2021) report that, on average, PP is applied for 15h/day, and users with indication to comply with PP are in this position for longer (average of 16h/day) than those who do not have an indication for PP (average of 14 hours/day). For Scaramuzzo et al. (2021), the PP time averaged 16h/day. Bell et al. (2022) applied a longer period of PP, on average 23h/day, with an interval of on average 12h between pronations; and the first episode of PP, of each user, had an average of 16 hours. Still, there is reference that the application of longer periods of PP with a lower initial PaO2/FiO2 ratio, allow a superior response to PP, that is, a greater increase in oxygenation (Bell et al., 2022). It is also mentioned in the article by Langer et al., (2021) that the PP was applied on average 18.5h/day (16h to 22h).

Parker et al. (2021), is the only author who presents data on the variability of PP time per participant, with a minimum time of 1h and a maximum of 93h. This demonstrates a positive effect, with an increase in the PaO2/FiO2 ratio at 39h, 51h and 93h, and that it tends to be maintained after 7h, even in PD.

- Mortality rate
As for the mortality rate, Stilma et al. (2021) showed no significant differences at 28 days or 90 days. However, they found that users with no indication to comply with PP had a lower rate (28.6% in users not positioned in PP and 31.3% in users in PP). For users with indication for PP, the mortality rate wasand 41.3% in users who did not comply with PP vs 34.1% in those who did. At 90 days, the authors report having obtained similar values. When analyzing the population with indication for PP, the group that fulfilled PP, despite having a greater number of users with severe and moderate ARDS, and a reasonPaO2/FiO2< 150 mmHg, showed a lower mortality rate (34.1%), compared to those who did not comply with PP (41.3%).

For Scaramuzzo et al., (2021), the mortality rate in ICU was higher in the case of users who did not respond to PP. For Langer et al., (2021), the mortality rate is higher in PP (41%), as is the severity of ARDS by COVID-19.

DISCUSSION
Of the analyzed studies, there is a discrepancy in the analyzed population, by each author. Even so, the total number of cases (n = 2154 users) analyzed is considered an adequate group to be able to infer conclusions. The patients included in the studies were classified mainly in terms of severe and moderate pathology, according to the Berlin criteria (value of the PaO2/FiO2 ratio). According to WHO data, when the ratio value is less than 150 mmHg, the greater the indication to perform PP, whose time must be between 12 to 16 hours a day (Parker et al., 2021). Most studies included in the Scoping Review corroborate this indication, having applied PP for an average of 15 to 16 hours per day. Thus, it can be said that the minimum time to apply in the PP must be 16 hours.

Regarding the PaO2/FiO2 ratio, five of the seven articles analyzed are unanimous in the presentation of results, referring to an improvement in the PaO2/FiO2 ratio, as soon as the user is positioned in PP.Taenaka et al.
(2021) found that, regardless of the PEEP value, the PaO2/FiO2 ratio was higher when users were in PP. Langer et al., (2021), analyzed two working groups, verifying that in the first the ratio decreases and in the second it meets the expected, the increase in the ratio. The difference in their results can be explained by the high number of users diagnosed with severe ARDS, with indication to comply with PP, present in the first group, which can reduce the positive results. Finally, Rossi et al., (2022), infer that they do not verify significant differences in the value of the ratio between the dorsal position and the PP; since the alteration of the users’ decubitus allows the alteration of the positioning of the atelectasis, which becomes a compensatory mechanism. This is explained by the fact that PP allows the expansion of the collapsed dorsal lung regions.

In terms of resupination cycles, it must be noted that after resupination, changes in the PaO2/FiO2 ratio, pulmonary compliance and formation of atelectasis are evident compared to previous values. Thus, Parker et al., (2021); Bell et al., (2022) and Langer et al., (2021) demonstrated a decrease in the PaO2/FiO2 ratio after the patient was placed in PD, following PP. However, comparing these values with those of the initial PD, the increase is evident. These changes are due to the fact that the posterior side of the lungs has a larger area, compared to the anterior side, which will allow gas exchange to be carried out more efficiently. As for the existence of atelectasis, only addressed in Rossi et al. (2022) he argues that after resupination, the amount of atelectasis is small relative to the initial PD.

According to Parker et al. (2021) and Rossi et al. (2022), following resupination, there is a decrease in the pressure exerted on the rib cage, so the work of breathing will decrease and, consequently, lung compliance will increase.

Regarding pulmonary compliance, Bell et al. (2022) and Langer et al. (2021), argue that there are no significant changes. Taenaka et al. (2021), which evaluates the parameter according to the variation of the PEEP value, finds discrepancies in high PEEP. This difference is justified by the fact that when there is an increase in the value of PEEP, there is an induction of hyperinflation of the lung, leading to changes in perfusion. With insignificant numerical discrepancies.

When a COVID-19 infection occurs, there is a deficit in oxygenation and ventilation and a continuous accumulation of secretions, which leads to the appearance of atelectasis and dead spaces. Steinbach, T., (2021). on one of the studies analyzed, there was a decrease in atelectasis and dead spaces when applying PP (Taenaka et al., 2021). However, once again, differences were presented by Taenaka et al., (2021), in case 2, when there is an increase in PEEP, in which the dead space increased, being higher in the PP. The justification for the increase in the value of PEEP and its action on the ineffectiveness of gas exchange due to lung hyperinflation. Rossi et al., (2022), verifies that there is a redistribution of the location of atelectasis and that their decrease is notorious. Tal happens because in PP, there is an increase in the compression exerted by the weight of the lung in the ventral region and a decompression in the dorsal region (Rossi et al., 2022).

Regarding the mortality rate, there is a discrepancy in the values, with the same varying between 28.6% and 53.7%. Langer et al. (2021), start by showing a higher mortality rate in PP. However, its population has more severe ARDS (PaO2/FiO2 ratio < 150 mmHg), which in itself is a poor prognostic factor for increased mortality. The same finds Stilma et al., (2021).

As for the limitations of the present
study, the great heterogeneity of the criteria/parameters applied in the PP and in the modes of application of the VMI stands out, which can create variants in the conclusions obtained. Furthermore, as it is a relatively recent topic, with little scientific evidence and no protocols, it does not allow significant conclusions to be applied in clinical practice.

CONCLUSION

The applicability of PP is not yet clearly described in the literature. However, given the results presented, it appears that the PP, in users under IMV with COVID-19, compared to PD, presents benefits. The parameter with the best results is the PaO2/FiO2 ratio, showing its increase. Another point of agreement among the authors is the time of PP, which must be applied for at least a period of 16 hours a day. The remaining parameters evaluated present discrepancies and minor changes, which leads us to infer that there are several variables to be taken into account, such as the characteristics of users, type and severity of the pathology and the need for more controlled studies with a more homogeneous population. Thus, it is important to encourage further studies on this topic, with the application of standard and specific protocols, to achieve more complete results on the subject.

However, SP must not be undervalued, both in clinical nursing practice and in the health area itself, as it may induce health gains. In the context of clinical practice, we infer that the PP may continue to be applied to a greater number of users, depending on the clinical evaluation, despite the need for protocols, since no worsening of the health status of the users was identified after this intervention.

REFERENCES


