

Benefits of positioning in ventilatory improvement in preterm newborns in the neonatal intensive care unit

Benefícios do posicionamento na melhora ventilatória em recém-nascido pré-termo na unidade de terapia intensiva neonatal

Beneficios del posicionamiento en la mejora ventilatoria en recién nacidos prematuros en la unidad de cuidados intensivos neonatales

RESUMO

Objetivo: Analisar, através da literatura, os benefícios do posicionamento terapêutico na melhora ventilatória em recém-nascido pré-termo internado na unidade de terapia intensiva neonatal. **Método:** Trata-se de uma revisão integrativa da literatura e teve como forma de coleta de dados a busca de artigos científicos nas bases SciELO, BVS, MEDLINE, PUBMED, PEDro e LILACS. Os critérios de inclusão foram artigos onde relatavam os benefícios que o posicionamento impacta na melhora ventilatória de recém-nascidos prematuros internados, que foram publicados entre os anos entre 2010 a fevereiro de 2022. **Resultados:** A amostra do estudo foi composta por 7 trabalhos, os quais identificaram que o posicionamento em prono e decúbito lateral foram mais eficazes na função pulmonar. **Conclusão:** O posicionamento terapêutico é essencial em uma unidade de terapia intensiva neonatal, impacta positivamente na mecânica respiratória e promove o bem-estar geral do recém-nascido pré-termo.

DESCRIPTORES: Posicionamento; Terapia respiratória; Recém-nascido; Prematuridade; Unidade de terapia intensiva neonatal.

ABSTRACT

Objective: To analyze, through the literature, the benefits of therapeutic positioning in ventilatory improvement in preterm newborns admitted to the neonatal intensive care unit. **Method:** This is an integrative literature review and the data collection method was to search for scientific articles in the SCIELO, BVS, MEDLINE, PUBMED, PEDro and LILACS databases. **Inclusion criteria** were articles yesterday reporting the benefits that positioning impacts on the ventilatory improvement of hospitalized premature newborns, which were published between the years 2010 to February 2022. **Results:** The study sample consisted of 7 studies, the which identified that prone and lateral decubitus positioning were more effective in lung function. **Conclusion:** Therapeutic positioning is essential in a neonatal intensive care unit, it positively impacts respiratory mechanics and promotes the general well-being of the preterm newborn.

DESCRIPTORS: Positioning; Respiratory therapy; Newborn; Prematurity; Neonatal intensive care unit.

RESUMEN

Objetivo: analizar, a través de la literatura, los beneficios del posicionamiento terapéutico en la mejoría ventilatoria en recién nacidos prematuros ingresados en la unidad de cuidados intensivos neonatales. **Método:** Se trata de una revisión integrativa de la literatura y el método de recolección de datos fue la búsqueda de artículos científicos en las bases de datos SCIELO, BVS, MEDLINE, PUBMED, PEDro y LILACS. Los criterios de inclusión fueron artículos publicados ayer entre los años 2010 y febrero de 2022 que reportaron los beneficios que el posicionamiento impacta en la mejoría ventilatoria de los recién nacidos prematuros hospitalizados. **Resultados:** La muestra de estudio estuvo compuesta por 7 estudios, los cuales identificaron que las posiciones en decúbito prono y lateral fueron más efectivas en la función pulmonar. **Conclusión:** El posicionamiento terapéutico es fundamental en una unidad de cuidados intensivos neonatales, impacta positivamente en la mecánica respiratoria y promueve el bienestar general del recién nacido prematuro.

DESCRIPTORES: Posicionamiento; Terapia respiratoria; recién nacido; precocidad; Unidad de cuidado intensivo neonatal.

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Juliane Carneiro Machado

Resident Physiotherapist in Neonatal and Pediatric Intensive Physiotherapy at the Getúlio Vargas University Hospital, Bachelor in Physiotherapy and postgraduate in Adult Intensive Physiotherapy.
ORCID: 0000-0001-8358-0642

Denilson da Silva veras

Professor of the Physiotherapy course at Universidade Paulista–UNIP and CEUNI–FAMETRO, Bachelor of Physiotherapy, Master.

ORCID: 0000-0002-2029-6692

Hana Karine Costa Sena

Physiotherapist at Hospital Delphina Abdel de Aziz – INDSH, Bachelor of Physiotherapy, Residency in Neonatal and Pediatric Intensive Physiotherapy.

ORCID: 0000-0001-7356-215X

Camila Alves Barreto

Physiotherapist at UNIMED Manaus, Physiotherapist at Francisca Mendes University Hospital, Physiotherapist at SAMEL Manaus, Bachelor of Physiotherapy, Residency in Neonatal and Pediatric Intensive Physiotherapy.

ORCID: 0000-0001-8358-0642

Ana Beatriz da Costa Lameira

Resident Physiotherapist in Neonatal and Pediatric Intensive Physiotherapy at Hospital Universitário Getúlio Vargas

ORCID: 0000-0001-7321-645X

Gabriel Vitor Caldas de Moura

Physiotherapy Intern – SEMSA/UFAM, Graduation in progress in Physiotherapy at the Federal University of Amazonas – UFAM.

ORCID: 0000-0001-9095-370X

Fernanda Liarte Teodósio

Physiotherapy Intern – SEMSA/UFAM, Graduation in progress in Physiotherapy at the Federal University of Amazonas – UFAM.

ORCID: 0000-0002-8728-9702

José Henrique Gurgel Medina

Home Physiotherapist, Bachelor of Physiotherapy.

ORCID: 0000-0001-7245-267X

INTRODUCTION

The premature newborn, or preterm, is any child with a gestational age of less than 37 weeks. This classification is subdivided into extreme preterm newborns: less than 28 weeks, very premature: between 28 and 32 weeks, and late or moderate preterm: between 32 and 37 weeks of gestation.¹ There are several predisposing factors for premature birth, among them is the primiparous mother, complications, gestational infections and socioeconomic aspects. Prematurity makes the newborn more exposed to changes in motor development, a determining factor for neonatal death, hence the importance of awareness of a given subject.² The premature neonate is vulnerable due to the complications of their physiological immaturity and still needs to deal with the consequences of prolonged hospitalization. Therefore, for such events, they need greater attention

for their best development.³

According to the World Health Organization (WHO), about 20 million low birth weight newborns are born worldwide as a result of prematurity, which in turn causes large numbers of hospitalizations due to the child's anatomic-physiological immaturity.⁴ Prematurity is the number one cause of deaths of preterm newborns, and also a very important factor for the occurrence of respiratory diseases due to immaturity of the respiratory system, therefore, such a system will be prone to infections. Both the factors that cause prematurity and the factors resulting from it alter the development of the respiratory system, increasing the chances of developing lung diseases.⁵

With the number of cases of premature newborns increasing more and more, the period of hospitalization also increased, mainly due to the immaturity of the lung.⁶ In Neonatal Intensive Care Units, external stimuli are frequent, neonates

are subject to pain, exposure to lights and noise, which can cause stress and instability in their physiological control.⁷ Improper positioning can cause long-term permanent motor, postural and behavioral disturbances.⁸ The hospital environment is different from the maternal environment, and their day-to-day lives differ in terms of rhythm, intensity and visual, auditory, tactile, vestibular and proprioceptive stimuli. The newborn now lives with noise, sudden and inappropriate changes in position, constant external stimuli and constant crying. After leaving the mother's uterus, the newborn is placed in the incubator and is found in a different place than usual, consequently he is in constant stress, irritability and insecurity, in addition to constant contact with health professionals.⁹

Among the physiotherapeutic resources to mitigate the impacts caused by the immaturity of the preterm newborn's development is the therapeutic positioning,

as it promotes comfort, reduces stress, improves lung function, in addition to improving the sleep of these babies.¹⁰ Positioning is an important resource used in hospital interventions to avoid unnecessary energy expenditure, excessive sedation and promotion of analgesia¹¹, in addition to maintaining a more flexed and supported position with attention to midline posture and symmetry, helping ideal neuromotor development, simulating the intrauterine position and seeking greater comfort and relaxation.¹²

The positioning of the neonate is of paramount importance as it is a non-drug resource used during the period hospitalized in the Neonatal Intensive Care Unit.¹³ Thus, the objective of the present study is to identify, in the existing databases, the benefits of therapeutic positioning in ventilatory improvement in preterm newborns admitted to the neonatal intensive care unit.

METHODS

The present study is an integrative literature review carried out through bibliographic data, following the standards of clarity and rigor used in the research found, which allows the comparison of studies on a given subject, allowing a scientific summary of the proposed theme. The integrative review was performed according to the steps: elaboration of the guiding question, literature search, data collection, critical analysis of the included studies, discussion of the results and presentation of the integrative review.^{14,15}

The study was carried out by searching articles in the following databases: SCIELO (Scientific Electronic Library Online), MEDLINE (National Library of Medicine of the United States of America), LILACS (Latin American and Caribbean Literature on Health Sciences), PEDro (Physiotherapy Evidence Database), VHL (Virtual Health Library), PubMed, updated journals and articles. The guiding question of the study that carried out the data search was: Does therapeutic positioning have benefits in ventila-

tory improvement in preterm newborns hospitalized in a Neonatal Intensive Care Unit?

Twenty articles were selected using the following Health Science Descriptors (DeCS) associated with Boolean operators: positioning AND respiratory therapy AND newborn AND prematurity AND neonatal intensive care unit.

The inclusion criteria were articles that reported on the benefits that positioning impacts on the ventilatory improvement of hospitalized premature newborns, which were published between 2010 and February 2022 and in English and Portuguese. The exclusion criteria were articles that did not meet the inclusion criteria, duplicates and studies with inconsistent results and dubious methodology. The articles included in the search can be found in PubMed, in Latin American and Caribbean Literature on Health Sciences (LILACS) and in the Scientific Electronic Library Online (SCIELO).

In this way, the studies were selected through a research and thorough reading, with an evaluation of all the content that was approached, which answered the guiding question of the work. Next, flowchart 1 demonstrates the methodological process of the integrative literature review.

RESULTS

The present study included 7 related

articles that were relevant or that met the inclusion criteria, as can be seen in the following table:

DISCUSSION

In the cross-sectional interventional study by Souza et al.²³ 28 infants with a gestational age at birth between 31 and 36 weeks, clinically stabilized and weighing more than 1,000 g, were selected. The children were placed in three positions: without therapeutic positioning, therapeutically positioned in pronation and therapeutically positioned in supination, for 30 minutes each. The results obtained showed that oxygen saturation remained at average values in all recumbencies. Respiratory rate was better and with less variability in pronation, and worse without therapeutic positioning. Regarding heart rate, all values were within the normal range in the evaluated decubitus, but the mean value was better in the prone position. Therefore, prone positioning improved breathing pattern compared to supine positioning.

In turn, Olmedo et al.²⁴, in a descriptive intervention study that included 20 preterm newborns between 24 and 36 weeks of gestational age, with vital signs within the normal range. The children were randomized into two groups,

group I underwent Kangaroo Mother Care (MMC - Método Mãe Canguru) and group II in Prone Positioning (PP).

Flowchart 1 - Methodological process of the integrative literature review:



Source: The author, 2022.

The groups were evaluated for three consecutive days, undergoing measurement of heart rate, respiratory rate, oxygen saturation and temperature. As a result, the children who underwent MMC did not show significant differences in the 3 days in their vital data.

Children in the PP group also had no significant difference in values during the 3 days of evaluation. Therefore, there is no better performance in one group compared to the other. In the PP group, the respiratory rate was higher before the application of the technique, evaluated on the 1st and 3rd days. In the MMC group, this difference was significant only on the 3rd day. As for heart rate, there was a significant reduction on the 3rd day after therapy in both the MMC and PP groups. In relation to oxygen saturation, there was a significant increase only on the 3rd day in the MMC group. In the PP group, oxygen saturation significantly increased on the 1st and 3rd day after the intervention.

From the randomized study by Wu et al.²⁵, 67 neonates were treated with mechanical ventilation therapy, divided into a supine position group and an alternate position group (4h in supination and 4h in prone position). Among the results obtained, the oxygenation index, oxygen pressure, dynamic compliance and tidal volume in the alternate position were significantly higher compared to the supine position. The carbon dioxide pressure was not significantly different, there was only a small increase in the alternate position. Therefore, this study showed that respiratory mechanics and oxygenation greatly improved in the alternate position group compared to the supine position group.

Still in the scope of neonatal intensive care, Morsch et al.²⁶, included 12 preterm newborns hospitalized between 27 and 37 weeks of gestational age. The neonates were first positioned in supination, later in the prone position for a period of 30 minutes, and then again in the supine position for 10 minutes, and the parameters of heart rate, respiratory rate and oxygen

Table 1 - Distribution of studies according to author, title, type of study, journal and results.

Author/year	Title	Study type	Journal	Results
Lewis et al. (2014)	The effects of alternative positioning on preterm infants in the neonatal intensive care unit: A randomized clinical trial.	Randomized	Research in Developmental Disabilities	Preterm infants in alternative placement (Dandle Roo by DandleLion Medical) during admission to the neonatal intensive care unit demonstrated less asymmetry at hospital discharge compared to infants in traditional placement methods.
Gouna et al. (2013)	Positioning Effects on Lung Function and Breathing Pattern in Premature Newborns.	Randomized	The Journal of Pediatrics	The results showed that the left lateral and prone position improved lung function, optimizing ventilation strategy and lung volume.
Hough et al. (2013)	Effect of Body Position on Ventilation Distribution in Ventilated Pre-term Infants.	Randomized	Pediatric Critical Care Medicine	In infants on Continuous Positive Airway Pressure (CPAP), inflation was synchronized in the anterior and posterior lung regardless of body position. In spontaneously breathing babies, the posterior lung filled earlier than the supinated anterior lung. There was no difference in filling between the right and left lungs for the spontaneously breathing babies, whereas in the babies on CPAP, the right lung filled earlier than the left.
Santos et al. (2018)	Clinical application of the Standard Operating Procedure for Positioning with preterm infants. (Aplicação clínica do Procedimento Operacional Padrão de Posicionamento com prematuros.)	Randomized	Revista Brasileira de Enfermagem	The standardized positioning of supination, lateral decubitus and pronation with the help of nests, rollers and other supports is capable of improving the behavioral and physiological state, reducing pain and the newborn's respiratory rate.
Yin et al. (2015)	Semi-Prone position can influence variability in respiratory rate of premature infants using nasal CPAP.	Randomized	Journal of Pediatric Nursing	Premature babies who received nasal CPAP sleeping in the semi-prone position had the most stable respiratory rate. The lateral position did not improve the respiratory rate.

saturation were verified during the last minute of each positioning. As a result, the prone position provided a decrease in heart rate and respiratory rate and an increase in oxygen saturation compared to the initial supine position. When the neonates were positioned in supination again, the values returned to those found before the prone position. In conclusion, the prone position promoted an improvement in oxygenation as well as a decrease in respiratory distress, promoting an improvement in the clinical condition of the newborn without generating cardio-respiratory instabilities.

CONCLUSION

Therapeutic positioning is one of the physiotherapeutic resources used within a neonatal intensive care unit to alleviate the impacts caused by premature birth, promoting better respiratory mechanics, body symmetry, decreasing episodes of apnea and hypoxia and promoting general well-being for the newborn, since it

Utario et al. (2017)	The quarter prone position increases oxygen saturation in premature infants using continuous positive airway pressure.	Randomized	Comprehensive Child and Adolescent Nursing	The prone position was significantly more effective in improving the oxygenation status of preterm infants using CPAP than supine.
Lanza et al. (2012)	Benefits of prone position associated with CPAP in premature newborns. (Benefícios do decúbito ventral associado ao CPAP em recém-nascidos prematuros.)	Cross sectional	Fisioterapia e pesquisa	The neonates started in supination for 1h, followed by the lateral position and soon after for pronation. There was no significant change in heart rate, respiratory rate and oxygen saturation. There was a statistically significant reduction in respiratory distress after placement in the prone position.

Source: The author, 2022.

is up to the physical therapist to obtain knowledge of the impacts caused by each position, whether in prone, supine or lateral decubitus. It is important to highlight that more studies are needed to expand knowledge about the positions

in relation to respiratory development and pulmonary ventilation of preterm newborns hospitalized in a Neonatal Intensive Care Unit.

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