

IMPACT OF USING NASAL CPAP IN THE DELIVERY ROOM ON RESPIRATORY STABILIZATION OF PREMATURE NEWBORNS

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Abstract: Interventions in the delivery room have changed in an attempt to improve the prognosis of premature newborns (PTNB), the use of nasal continuous positive pressure (CPAP) has been shown to be effective soon after birth, avoiding orotracheal intubation and the resulting complications of invasive mechanical ventilation. The study aims to analyze the impact of using prophylactic nasal CPAP in the delivery room on preterm infants to avoid the use of invasive ventilatory support. The early application of nasal CPAP was carried out shortly after the birth of the newborn (NB), still in the delivery room, according to institutional protocol criteria. Inclusion criteria: Newborns with gestational age up to 33 and 6/7 weeks of gestation (<34 weeks) or up to 1,500g. Those newborns who did not require invasive support within 48 hours of birth were considered successful in using the resource. 92 PTNBs were included in the protocol from June/2021 to December/2023. 24 newborns were excluded from the protocol according to the exclusion criteria. Of the 68 newborns eligible for CPAP, 89.7% (61) did not require invasive support, which was considered successful. We found a success of 89.7% in the use of this resource, which, in an early and non-invasive manner, proves to be important in preventing complications related to invasive ventilatory support.

Keywords: Prematurity; CPAP; Physiotherapy

INTRODUCTION

Newborn respiratory distress syndrome (RDS) or hyaline membrane disease is the clinical expression resulting from alveolar surfactant deficiency associated with the structural immaturity of the lungs. Its incidence and severity are directly related to the degree of prematurity. Preterm newborns (PTNB) are biologically immature and deficient in surfactant production, with the

surfactant's function being to reduce the surface tension of the pulmonary alveolus, preventing its collapse during expiration. Therefore, the deficiency makes PTNBs more susceptible to some degree of respiratory failure, which leads to the need for ventilatory support. (Barroso et al, 2023)

Several interventions in the delivery room have changed over the years in an attempt to improve the prognosis of newborns, including premature babies, and the use of continuous airway pressure (CPAP) has been shown to be effective soon after birth as an attempt to keep the lung open, avoiding orotracheal intubation and complications arising from invasive mechanical ventilation (IMV), such as ventilation-associated pneumonia and the development of bronchopulmonary dysplasia. (King et al, 2019; Miyoshi, 2015)

The CPAP can be defined as the use of positive ventilation through a device that connects the ventilator to the patient through non-invasive interfaces, such as a face mask, nasal mask, orotracheal or nasotracheal cannula and nasal prong, which is the most used currently. Positive transpulmonary pressure is continuously applied to the airways during the respiratory cycle, preventing the complete elimination of inspired gas, which results in an increase in functional residual capacity; improvement of gas exchange; preservation of alveolar surfactant function, thus reducing surface tension within the alveolus and preventing alveolar collapse; aid in the redistribution of lung fluid; stabilization of the rib cage; optimization of diaphragm activity and reduction of respiratory effort. (Jabraeili et al, 2017; Miyoshi, 2015)

Although it is considered the gold standard, non-invasive ventilation is associated with some complications such as abdominal distension, airway obstruction, pneumothorax, internal or external nasal injury, which is the most common complication with an incidence of

20% to 60%. Despite the evolution of interfaces in terms of quality and adaptation to the newborn, the incidence of skin damage caused by their use is still relevant in neonatology. The mechanism of skin injury is similar to that which occurs in pressure injuries and the lower the gestational age and birth weight, the longer the period of stay on NIV, increasing the risk of injury. Therefore, some care must be taken, with the aim of preventing the incidence of injuries, such as the use of a quality prong and mask, adequate size and fixation, rotation of interfaces, humidification and heating of gases, frequent inspection of the skin, use of protective barriers. (Bonfim et al, 2014)

This work's main objective is to analyze the effectiveness of applying prophylactic nasal CPAP in the delivery room in premature newborns below 34 weeks of gestation or weighing less than 1,500 grams.

In a private hospital in Greater ABC, when a pregnant woman with a newborn under 34 weeks and/or weighing less than 1,500g is identified, the physiotherapist is informed and directed to the delivery room with the doctor.

After birth, the neonatologist takes the PTNB to the sterile and heated field, performs airway aspiration when necessary, observes and clinically evaluates the PTNB, and decides whether he will need invasive ventilatory support or whether he will opt for early application of positive airway pressure through the nasal prong and its own circuit using the Servo-I mechanical ventilator connected to the oxygen torpedo.

Inclusion criteria: all newborns of pregnant women up to 33 and 6/7 weeks of gestation (below 34 weeks) or up to 1,500g.

Exclusion criteria: newborns intubated in the delivery room during resuscitation, those with diaphragmatic hernia, omphalocele, gastroschisis, esophageal atresia or malformation that prevents the installation of

the nasal prong, in addition to those born at more than 34 weeks and weighing more than 1,500g.

A total of 92 preterm newborns included in the CPAP prophylactic protocol were evaluated from June/2021 to December/2023. With 24 excluded due to intubation in the delivery room, among the 68 newborns who were eligible for CPAP, 7 progressed to invasive mechanical ventilation in less than 48 hours.

From 2011 to 2019, Brazil recorded approximately 3 million premature births, corresponding to a prevalence of 11%, which places the country among the ten with the highest occurrence of preterm births in the world. Considering the impact of prematurity on the morbidity and mortality of newborns, with possible permanent sequelae, and the high costs for the health system, the use of prophylactic CPAP improves the respiratory prognosis and reduces costs. (Alberton, Rosa, Iser, 2024; Silva et al 2022)

As a consequence of the immaturity of the respiratory system of premature newborns, the use of prophylactic CPAP in the delivery room in preterm infants has been shown to be effective, as observed in the present study, as it prevents alveolar collapse, reducing the need for orotracheal intubation and invasive mechanical ventilation, one of the main factors in lung injury in premature infants. Corroborating our study, Nelin and Bhandari (2017) recommend the use of early non-invasive mechanical ventilation, compared to its rescue use, as it reduces the need for surfactant, mechanical ventilation and the development of bronchopulmonary dysplasia in premature newborns.

Regarding the type of ventilator used in the protocol, the risks of hyperoxia to the PTNB are evident, and when using the Servo-i ventilator during transport to the Neonatal Intensive Care Unit (ICU), despite it being a

short journey, we offer a fraction of inspired oxygen (FiO₂) of 100%, therefore, from 2024 we started using the oxymag ventilator, which due to the venturi present system, it is possible to reduce FiO₂ to at least 35%, even so, we continue to seek to improve the protocol, so that it is safe and qualifiable.

Regarding the main reasons for protocol failure, we observed that it occurred due to the need for high parameters to maintain adequate peripheral oxygen saturation and the occurrence of apneas. Furthermore, we realized that the lower the gestational age, the longer the newborn's period on CPAP and consequently the greater the risk of injury incidence. Therefore, we adopted preventive measures such as interspersing the interface every 6 hours, massaging the region and applying hydrocolloid and velcros.

Due to the neurological and respiratory immaturity of these premature newborns,

physiotherapeutic care is not an addition to treatment, but a necessity in a Neonatal ICU. The role of the physiotherapist is to help favor the completion of the maturation of these systems through lung clearance and re-expansion techniques that aim to leave the airways patent, facilitating ventilation, perfusion and pulmonary diffusion. However, there are few studies that address the physiotherapist's role in the delivery room, and more studies are needed to emphasize the importance of this professional, as it has become increasingly indispensable in the care and ventilatory support processes for newborns. (Borges et al; Silva et al 2022)

We found a success of 89.7% in the use of this resource, which, in an early and non-invasive manner, proves to be important in preventing complications related to invasive ventilatory support.

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