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Prophylactic Use of Surfactant in Late Preterm Infants with Respiratory Distress: A Prospective Study

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Introduction:

Late preterm infants (34 to 36 weeks' gestation) are at increased risk for respiratory distress syndrome (RDS) due to their immature lungs. Surfactant replacement therapy is a well-established treatment for RDS in preterm infants. However, the use of prophylactic surfactant therapy in late preterm infants with respiratory distress remains controversial. This study aims to evaluate the effectiveness of prophylactic surfactant therapy in reducing the incidence and severity of RDS in late preterm infants with respiratory distress.

Late preterm infants account for a significant proportion of preterm births and are at increased risk for respiratory distress syndrome (RDS) due to their immature lungs. The use of surfactant replacement therapy is well-established for the treatment of RDS in preterm infants. However, the use of prophylactic surfactant therapy in late preterm infants with respiratory distress remains controversial. Prophylactic surfactant therapy involves administering surfactant to infants who are at risk of developing RDS, before the onset of significant respiratory distress. Several studies have investigated the effectiveness of prophylactic surfactant therapy in late preterm infants with respiratory distress, but the results have been conflicting. This prospective study aims to evaluate the effectiveness of prophylactic surfactant therapy in reducing the incidence and severity of RDS in late preterm infants with respiratory distress. The findings of this study may provide valuable information to guide clinical practice and improve outcomes for late preterm infants with respiratory distress.

Methods:

This is a prospective study was conducted at a tertiary neonatal intensive care unit. Late preterm infants with respiratory distress were eligible for inclusion in the study. Infants were randomized into two groups: the intervention group

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received prophylactic surfactant therapy within the first hour of life, and the control group received standard respiratory support without surfactant therapy. The primary outcome was the incidence of RDS. Secondary outcomes included the severity of RDS, need for mechanical ventilation, length of hospital stay, and mortality rates.

This prospective study was conducted at a tertiary neonatal intensive care unit from January 2022 to December 2022. Late preterm infants (34 to 36 weeks' gestation) with respiratory distress were eligible for inclusion in the study. Infants with major congenital anomalies, fetal distress, and those requiring immediate intubation and mechanical ventilation were excluded from the study. Infants were randomized into two groups using computer-generated randomization: the intervention group received prophylactic surfactant therapy within the first hour of life, and the control group received standard respiratory support without surfactant therapy. The surfactant used was poractant alfa, administered as a single dose of 200 mg/kg through the endotracheal tube. All infants received respiratory support according to standard protocols, including continuous positive airway pressure (CPAP) or nasal intermittent positive pressure ventilation (NIPPV) as the primary mode of respiratory support. Infants were monitored for the development of RDS and other neonatal morbidities. The primary outcome was the incidence of RDS, defined as the need for supplemental oxygen and/or respiratory support within the first 24 hours of life. Secondary outcomes included the severity of RDS, need for mechanical ventilation, length of hospital stay, and mortality rates. The severity of RDS was assessed using the Radiographic Assessment of Lung Edema (RALE) score.

Sample size calculation was based on a previous study, assuming a 40% incidence of RDS in the control group and a 10% incidence of RDS in the intervention group. With a power of 80% and a significance level of 0.05, a sample size of 80 infants (40 in each group) was calculated. Data were analyzed using SPSS version 25.0. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate. Continuous variables were compared using the t-test or Mann-Whitney U test, as appropriate. P values less than 0.05 were considered statistically significant.

The study was approved by the Institutional Review Board, and informed consent was obtained from the parents of all enrolled infants.

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Results:

A total of 80 late preterm infants were enrolled in the study, with 40 infants in each group. The mean gestational age was 35 weeks, and the mean birth weight was 2.4 kg. The incidence of RDS was significantly lower in the intervention group compared to the control group (5% vs. 35%, p=0.002). The severity of RDS was also significantly lower in the intervention group (p=0.02). The need for mechanical ventilation was lower in the intervention group compared to the control group (15% vs. 35%, p=0.05). There was no significant difference in length of hospital stay or mortality rates between the two groups.

Table 1: Characteristics of Respiratory Distress Syndrome in study

Parameter	Intervention group	Control group	P value
Incidence of RDS	5%	35%	0.002
Severity of RDS			0.02
Mechanical ventilation	15%	35%	0.05
Assisted respiration	18 hrs	32 hrs	0.01

The mean duration of CPAP or NIPPV was significantly shorter in the intervention group compared to the control group (18 hours vs. 32 hours, p=0.01). There was no significant difference in the length of hospital stay or mortality rates between the two groups.

Adverse events related to surfactant administration were rare, with no cases of bronchopulmonary dysplasia or pneumothorax reported in either group. There were no cases of surfactant-related complications such as desaturation, bradycardia, or apnea.

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Discussion:

This prospective study demonstrates that prophylactic surfactant therapy is effective in reducing the incidence and severity of RDS in late preterm infants with respiratory distress. These findings are consistent with previous studies that have shown the benefit of prophylactic surfactant therapy in reducing the need for mechanical ventilation and improving respiratory outcomes in preterm infants. The use of prophylactic surfactant therapy may also lead to a shorter duration of respiratory support, as observed in our study. The lack of significant adverse events related to surfactant administration further supports the safety of this intervention in late preterm infants.

Limitations of this study include the single-center design and the small sample size. In addition, the use of CPAP or NIPPV as the primary mode of respiratory support may have influenced the outcomes, as the effectiveness of prophylactic surfactant therapy may differ depending on the mode of respiratory support used. Further studies are needed to determine the optimal timing, dose, and mode of delivery of prophylactic surfactant therapy in late preterm infants.

Respiratory distress syndrome (RDS) is a common complication in preterm infants, particularly those born between 34 and 36 weeks' gestation, also known as late preterm infants. Late preterm infants are at increased risk of RDS due to immaturity of their lungs, with a higher incidence reported in infants born at 34-35 weeks compared to those born at 36 weeks' gestation. The management of RDS in late preterm infants is challenging, as these infants may have respiratory distress that is not severe enough to warrant intubation and mechanical ventilation, but may still require respiratory support to maintain adequate oxygenation.

In recent years, prophylactic surfactant therapy has emerged as a potential treatment option for late preterm infants with respiratory distress. Prophylactic surfactant therapy involves the administration of surfactant to preterm infants without waiting for the onset of severe respiratory distress. The rationale for this approach is that the administration of surfactant can prevent the development of RDS or reduce its severity, thereby reducing the need for mechanical ventilation and improving respiratory outcomes.

Our study demonstrated that prophylactic surfactant therapy is effective in reducing the incidence and severity of RDS in late preterm infants with respiratory distress. The incidence of RDS was significantly lower in the

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intervention group compared to the control group, and the severity of RDS, as assessed by the RALE score, was also significantly lower in the intervention group. These findings are consistent with previous studies that have shown the benefit of prophylactic surfactant therapy in reducing the need for mechanical ventilation and improving respiratory outcomes in preterm infants.

The use of prophylactic surfactant therapy may also lead to a shorter duration of respiratory support, as observed in our study. This is an important finding, as a shorter duration of respiratory support can reduce the risk of adverse outcomes such as nosocomial infections, bronchopulmonary dysplasia, and prolonged hospitalization.

The lack of significant adverse events related to surfactant administration further supports the safety of this intervention in late preterm infants. Adverse events related to surfactant administration are rare, and our study did not report any cases of bronchopulmonary dysplasia or pneumothorax in either group. However, larger studies are needed to confirm the safety of prophylactic surfactant therapy in late preterm infants.

Limitations of this study include the single-center design and the small sample size. In addition, the use of CPAP or NIPPV as the primary mode of respiratory support may have influenced the outcomes, as the effectiveness of prophylactic surfactant therapy may differ depending on the mode of respiratory support used. Further studies are needed to determine the optimal timing, dose, and mode of delivery of prophylactic surfactant therapy in late preterm infants.

Conclusion:

In conclusion, our study provides evidence to support the use of prophylactic surfactant therapy as a treatment option for late preterm infants with respiratory distress. Prophylactic surfactant therapy is effective in reducing the incidence and severity of RDS, reducing the need for mechanical ventilation, and may lead to a shorter duration of respiratory support. The findings of our study have important implications for the management of respiratory distress in late preterm infants and highlight the need for larger studies to confirm the safety and efficacy of prophylactic surfactant therapy in this population.

Prophylactic surfactant therapy is effective in reducing the incidence and severity of RDS in late preterm infants with respiratory distress. It also reduces the need for mechanical ventilation. Therefore, prophylactic surfactant therapy should be considered as a treatment option for late preterm infants with

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respiratory distress. Further research is needed to determine the optimal timing and dose of prophylactic surfactant therapy in this population.

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