

Prophylactic Surfactant Vs. Selective Surfactant

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Preterm Birth and Respiratory Distress Syndrome

According to the World Organization (WHO), preterm birth continues to be a crucial health challenge globally and a leading cause of perinatal death and disability. It is estimated that 15 million babies are born prematurely around the world. Preterm infants face numerous plagues and Respiratory distress syndrome (RDS), is one of the challenges they experience. Respiratory distress syndrome (RDS) is a health disorder that affects premature neonates with underdeveloped lungs that cannot inhale enough oxygen to the body. Usually, the lungs contain alveoli coated with enough surfactants to facilitate efficient gaseous exchange. Lack of enough surfactants results in a condition where the lungs independently provide oxygen to the body. Surfactant deficiency results in respiratory failure, and it has been a significant cause of death and morbidity in preterm infants. Pulmonary hemorrhage, meconium aspiration syndrome, and sepsis also contribute to acute respiratory morbidity in preterm and term neonates suffering from surfactant deficiency. Pediatrics came up with surfactant replacement therapy so that they could save the lives of infants suffering from surfactant deficiency. This surfactant replacement therapy intends to reduce mortality and respiratory morbidity.

Development of Surfactant Replacement Therapy

By the early 1990s, surfactant replacement was validated as an effective therapy for preterm surfactant deficiency. Surfactant replacement can be done for both treatment and prevention purposes. Trials and clinical experiments have shown that surfactant preparations used either prevent or treat Respiratory distress syndrome. The prophylactic surfactant method is used for prevention, and it is administered to infants at high risk of contracting Respiratory distress syndrome. The prophylactic surfactant is applied in delivery rooms within less than 1 hour of mechanical ventilation after birth (rapid extubation). The selective surfactant is the second surfactant therapy option and is administered to infants who meet specific severities for Respiratory distress syndrome syndromes and predetermined supplemental oxygen thresholds. Rescue or selective surfactant is conducted within 12 hours after birth with the aim of treating the already established RDS (El-Dib, 2012).

Clinical Comparison of Administration Strategies

Since the establishment of surfactant replacement, numerous clinical trials have been performed to determine which is the best criteria for surfactant administration to preterm and term infants. In

1997, the Department of Paediatrics, Addenbrookes Hospital in Cambridge, published random controlled trials involving newborn infants at a postmenstrual age to meet the inclusion criteria. The group of infants who had received their first surfactant (prophylactic) had a 95% lower risk of subsequently acquiring mechanical ventilation, developing pulmonary air leak, and BDP. Infants in the prophylactic surfactant were also provided with more doses than those with the selective surfactant. The research of the five trials revealed that there was no significant difference between the two treatment strategies. However, stratified analysis showed that the prophylactic surfactant reduced mortality and pneumothoraxes by 39%. The trials also led to the conclusion that the difference in the occurrence of chronic lung disease was negligible (Rojas-Reyes, 2012). The use of prophylactic surfactant increases the risk of lung injuries and death in babies who have a high probability of developing RDS. The trials demonstrated that prophylactic surfactants resulted in a lower chance of air leaks and a lower mortality rate. Recent studies meant to improve the clinical trial outcomes suggest that selective therapy done to only the preterm and term neonates who suffer from respiratory contradictions is an efficient form of treatment. Also, the use of continuous positive airway pressure (CPAP) to achieve stabilization produced better results compared to the previous approaches used. The trials also provide plenty of strategies to prevent and treat surfactant deficiency, such as the use of maternal steroids (Rojas-Reyes, 2012).

Evidence from Trials of Prophylactic and Selective Treatment

In another clinical research, six trials involving 664 infants were studied. Two of the tests included infants whose age was between 25-35 weeks, while the rest enrolled babies using a bodyweight limit of 1250-1500g. All the infants were grouped into two groups, and surfactant treatment was administered differently according to the criteria of the selection meeting. One group that meets the requirements of radiologic evidence of RDS received rescue surfactant. The administration process was done within three hours of life. All the other kids who did not meet the criteria of radiologic evidence of RDS received prophylactic surfactant, and this was done within the specified time frame. During the trial, all the infants were provided with 120mg/kg of Newfactan and manual ventilation. The meta-analysis demonstrated that infants who received selective surfactant were able to extubate within 2 hours, and no infant who received prophylactic surfactant was able to do the same within the same time frame. However, the trial revealed that prophylactic surfactant increased pneumothoraxes. Finally, it was concluded that prophylactic surfactant was not advantageous over selective surfactant in reducing morbidity and mortality of respiratory distress syndrome (Sandri, 2010).

Cost and Resource Implications of Surfactant

Therapy

The cost of intensive care while administering both prophylactic surfactant and selective surfactant is high. The value is determined by the age of the infant regarding gestational age, where the younger the infant, the higher the price. Several factors determine whether a surfactant intervention can be performed. These include the availability of surfactants and the capacity to deliver CPAP and infant ventilators. The fact that surfactant medication needs to be refrigerated at all times before admission also makes the therapy process expensive. Given that most nurseries have limited resources, the dilemma of whether to provide early (prophylactic) surfactants or to use selective surfactants is solved by determining which therapeutic approach best utilizes their limited resources. Expert administration of NCPAP strategized intensive care is the key factor that led to the successful implementation of prophylactic surfactants and selective surfactants.

References

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