# COMPARİSON OF THE RESULTS OF TRANSCUTANEOUS CARBONDİOXİDE AND OXYGEN PRESSURE İN PREMATURE NEONATES WHO UNDERWENT MİNİMALLY INVASİVE SURFACTANT THERAPY (MIST) UNDER HEATED RESPİRATORY SUPPORT WİTH NASAL CANNULA HİGH FLOW AİR SUPPORT (HHHFNC) OR NASAL CONTİNUOUS AİRWAY PRESSURE (CPAP) METHODS

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**Comparison of the Results of Transcutaneous Carbondioxide and Oxygen Pressure in Premature Neonates Who Underwent Minimally Invasive Surfactant Therapy (MIST) Under Heated Respiratory Support With Nasal Cannula High Flow Air Support (HHHFNC) or Nasal Continuous Airway Pressure (CPAP) Methods**

## Study Protocol:

In premature babies (born before 37th week of pregnancy), surfactant production is insufficient since lung maturation has not been completed yet. Accordingly, surface tension increases in alveoli and it is difficult to keep the alveoli open, gas exchange is insufficient, and as a result, respiratory distress syndrome (RDS) occurs in premature babies. Severe respiratory failure occurs in the baby, it must be connected to the mechanical ventilator, even if hypoxia cannot be corrected, the baby may be lost. Intraracheal surfactant treatment is applied in the treatment of respiratory distress syndrome, which develops due to surfactant deficiency. With surfactant treatment, death due to RDS, mechanical ventilation requirement, morbidity due to lung disease, hospitalization times in neonatal intensive care units have been reduced and survival rates of premature babies have increased.

Intraracheal surfactant treatment is applied in RDS treatment. In recent clinical studies, two similar methods have been studied with a thin catheter without endotracheal intubation in the application of surfactant. One of these methods; Developed in Germany, it is LISA (the application of surfactant, which is less invasive), which is currently widely used in Europe. In the LISA method, surfactant is given after placing a thin flexible catheter into the trachea with the help of a laryngoscope (Magill's forceps may or may not be used) while the baby is in CPAP. The second method is the application of surfactant, which was developed in Australia and given by using a hard thin vascular catheter into the trachea while the baby is being followed up in CPAP only under direct laryngoscope without using forceps. This method is called MIST (minimally invasive surfactant treatment). In both methods, the aim is to give the surfactant warmed up to body temperature slowly in a few minutes with the help of an injector in a baby with spontaneous breathing under CPAP.

In the current RDS review (2019), it was emphasized that noninvasive respiratory support is the most appropriate way to support the breathing of preterm infants. Non invasive methods; CPAP is specified as bi-level CPAP, HHHFNC, positive pressure ventilation with nasal interval. CPAP devices provide gas flow under controlled pressure with probes firmly placed in the nose. Through the distension pressure; Supporting the opening of the upper airway, continued lung expansion and prevention of end-expiratory alveolar collapse (lung closure at the end of breath). Thus, it is easier to release the endogenous surfactant.

Heated high flow air support (HHHFNC) moistened with nasal cannula; It has been used as an alternative to nasal CPAP since 2013 RDS guideline. The utility mechanism allows the removal of carbon dioxide in the nasopharyngeal area, provides the anatomical dead space to be washed with air flow, reduces the disadvantage of the anatomical dead space. It also provides CPAP-like support thanks to its high flow rates. It reduces breathing work. It helps to reduce the FiO2 level, typically using a flow rate of 4-8 L / min.

According to the RDS review updated in 2019, early surfactant should be applied in infants with RDS. According to the latest recommendation, surfactant should be given if the baby's FiO2 (oxygen content in inhaled air) need is over 30%.

In our neonatal intensive care unit, respiratory support is given with nasal CPAP and HHHFNC instead of classical invasive (intubated) mechanical ventilation methods. In CPAP method, heated and humidified air is given a certain pressure (6-8 cmH2O), while in HHHFNC method, heated humidified

air is given at a certain flow rate (6-8 L / min). This study was planned to compare the results of infants who were given surfactant with MIST method under CPAP or HHHFNC support in the treatment of respiratory distress syndrome in premature babies. No blood will be collected from the babies included in this study, and nothing that will not be applied to babies who are not included in the study. If these babies need surfactant according to the chest X-ray and oxygen demand in the breathing air, surfactant support will be given by MIST method. In the follow-up of these babies, after the surfactant application, the follow-up application for each baby will be carried out; Blood gas will be taken in the second and sixth hour, and a chest radiograph will be taken in the sixth hour. The mechanical ventilation settings of the patient are made according to the values here. For example, the pressure given in case of insufficient oxygenation, the amount of oxygen is increased, the pressure given in case of hypercarbia is increased, the pressure is decreased in case of hypocarbia.

This measurement shows only partial carbon dioxide (PCO2) and partial oxygen (PO2) pressures in that instant blood gas. It is of great importance to protect the premature babies being monitored in the intensive care unit from hypoxia and hypercarbia, as well as the pressure, volume, oxygen-related trauma and injuries given by iatrogenically invasive or non-invasive respiratory support. Unnecessarily high supply of oxygen can cause oxygen radical damage and increase the risk of diseases associated with oxygen radical damage (premature retinopathy, necrotizing enterocolitis, bronchopulmonary dysplasia, periventricular leukomalacia). With the improvement of lung compliance and recovery of gas after surfactant treatment, carbon dioxide excretion may accelerate and hypocarbia may develop. Hypocarbia can cause intraventricular hemorrhage and periventricular leukomaliasis in premature babies.

During surfactant application, babies will be monitored (as in all babies in the NICU) saturation, peak heart rate, perfusion index (the ratio of nonpulsatile flow in the capillary bed) and t values will be recorded. For all these reasons, monitoring of PI, PVI and continuous transcutaneous PCO2 and PO2 values are of great importance for the prevention of mortality and morbidity, as well as monitoring of oxygen saturation values with pulse oximetry in premature babies.

Research Method:

In our hospital, it was planned to take a total of 40 patients born under 32 weeks and less than 1500 grams (20 patients being in the HHHNFC, 20 patients in the CPAP group). Patients will be consecutively distributed to two groups until they reach the specified number of patients.

In this study, it was aimed to monitor continuous oxygen saturation, PI, PVI, transcutaneous PO2 and PCO2 measurements just before, during and after the surfactant application and to compare the results of babies who received nCPAP and HHHFNC support.

At the end of the study, all data will be entered in an SPSS file and study statistics will be made. A database will be created using SPSS software. A p value of $<0.05$ was determined as the limit of significance.

Inclusion criteria

• Premature babies under 37 weeks of sleep at Hacettepe University Neonatal Intensive Care Unit,

• Infants who have been diagnosed with respiratory distress syndrome in the first 24 hours of life, who have received surfactant treatment under the nCPAP or HHHFNC method using the MIST method,

• Babies whose informed consent was obtained from their mothers and / or fathers

Exclusion criteria

• Term babies born 37 weeks and over

• Babies monitored for intubation due to severe respiratory failure

• Babies with hemodynamically unstable, severe hypotension

Major congenital anomalies (severe congenital heart disease, congenital diaphragmatic hernia etc.)

• Babies with chromosomal disorders

• Babies with hereditary metabolic disease

• Babies whose informed consent form could not be obtained from their mothers and / or fathers

• Babies whose mothers have early membrane rupture or chorioamnionitis

• Diabetic mother babies

• Families who want their children to leave the work at any time of the study

• Babies whose study data cannot be collected completely