Original Article

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Intubation, Surfactant Administration & Extubation to NCPAP–Its Outcome in Neonates with Respiratory Distress Syndrome

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Abstract

The purpose of the study is this study is to assess the effectiveness of dose of intratracheal surfactant administered during the progression of RDS followed by rapid extubation and institution of CPAP without mechanical ventilation as a cost - effective treatment. Parental informed consent was obtained prior to the procedure. Arterial blood gas analysis was performed before the procedure.Its is a descriptive case control study .Infants with surfactant therapy and NCPAP were taken as (surfactant group) and infants to whom parental consent was not given and who came late to hospital were taken as (control group). The total length of duration in the hospital is almost similar in both the groups. The reason being other than the respiratory problem in the surfactant group like NEC, and feeding problems. But the patients requiring the intensive care is less which may lessen the cost for the treatment and make it as a cost effective treatment. There is a significant decrease in the need for MV in the surfactant group compared to control group.The reduction in the need for MV decreased the risk of airleak syndrome and is advantageous in medical settings where resources are limited like in our country. There is a significant decrease in the need for MV in the surfactant group compared to control group.The reduction in the need for MV decreased the risk of airleak syndrome and is advantageous in medical settings where resources are limited like in our country.

Keywords: Pulomonary; Intubation; Surfactant.

Introduction

Respiratory distress syndrome , resulting from a deficiency of surfactant is the most frequent clinical respiratory disorder in preterm infants .It is the single most important cause of morbidity and mortality in preterm infants [1].

Lower the gestational age higher the incidence of RDS, accounting for nearly 80% incidence in preterm infants with gestational age < 28wks. Surfactant deficiency results in lower functional capacity, increase work of breathing and respiratory failure. Mechanical ventilation in it may induce varying degree of lung injury with epithelial disruption followed by fluid leakage and inflammatory response that can inactivate surfactant [2]. Mechanical ventilation is the single most risk factor in the development of BPD.

Intratracheal exogenous surfactant replacement therapy reduces mortality, air leak, and need for respiratory support in mechanically ventilated premature infants, with prophylactic or early surfactant therapy being superior to late rescue therapy in reducing mortality and respiratory morbidity [3,4].

By maintaining alveolar recruitment early implementation of continuous positive airway pressure (CPAP) by itself, without surfactant therapy, has been shown to improve outcome in infants with RDS [5,6]. However strategies that use NCPAP alone in mild to moderate RDS still result in up to 40% to 60% of patients requiring mechanical ventilation

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(MV) [7].

The purpose of the study is this study is to assess the effectiveness of dose of intratracheal surfactant administered during the progression of RDS followed by rapid extubation and institution of CPAP without mechanical ventilation as a cost - effective treatment.

Materials and Methods

Place of Study

Newborn babies with respiratory distress admitted to Basaveshwar Teaching & general hospital and Sangameshwar Teaching and General Hospital attached to M.R Medical College, Gulbarga.

Number of Cases

A total of 72 neonates who came with respiratory distress syndrome with <35 wks and <1.5kg were taken in the study including both the sex.

Duration of Study

The study was conducted from December 2012 to may 2014.

Inclusion Criteria

1. All neonates who are admitted in NICU with features of respiratory distress syndrome with < 35 wks & <1.5kgs were taken.
2. Features of RDS I) Tachypnea ii) Grunting iii) increase oxygen demand iv) Radiographic findings.

Exclusion Criteria

1. Neonates with APGAR score <2 at 5 min
2. Congenital malformations
3. Pneumonia & incompletely treated Pneumothorax.
4. Babies diagnosed with meconium aspiration syndrome.

Study Procedure

Parental informed consent was obtained prior to the procedure. Arterial blood gas analysis was performed before the procedure.Its is a descriptive case control study. Infants with surfactant therapy and NCPAP were taken as (surfactant group) and infants to whom parental consent was not given and who came late to hospital were taken as (control group).

The INSuRE Procedure

Intravenous access was obtained. A loading dose of capnea 20mg/kg was given at the start of the procedure to prevent apnea. The surfactant group received the required dose of survanta. Correct endotracheal tube placement was assessed clinically & radiologically .surfactant (4ml/kg) is admitted in four divided aliquots, according to manufacturer's instructions, followed by 5 to 10 minutes of hand ventilation.The infant was extubated and started/restarted on either bubble/ ventilator NCPAP.

Infants in the control group did not receive any surfactant and received the other modalities like NCPAP or MV as per required. At 1 to 2 hrs after intervention an ABG was performed.The further decisions are made on RDS scoring, SPO2, and ABG analysis.The criteria for intubation and MV included with FIO2 > 50% when o2 saturation of less than 90% rising co2 retention (PCO 2 > 55 mm of Hg) , (PAO 2 <50 mm of Hg) , apnea (> 20 sec) and moderate to severe retractions.

Analysis

The primary outcome of study is the INSuRE success which means not requiring MV and the failure group which needed the MV. The outcome in surfactant group and its benefits over only NCPAP (control group) in decreasing the mortality & morbidity that may due to MV predetermined secondary outcomes were duration of assisted ventilation , duration on NCPAP, pulmonary haemorrhage, apneic attack, air leak syndromes, and length of stay in the hospital.

Statistical Methods

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance.

Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two

or more groups.

Statistical Software

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data

Results

The primary outcome in the study group is the need for the subsequent ventilation.. 18(50%) in the surfactant group required MV & 26(72.7%) in the control group required MV. The use of surfactant decreased the need for MV by 22% in surfactant group than control group.

15 (41.7%) in the surfactant group & 20 (55.5%) in the control group showed mortality which is not statistically significant. There is high mortality in the control group than surfactant group may be due to less need for MV in surfactant group.

In our study the RDS score at the time of presentation had an corelation with the outcome. None showed mortality when presented with mild RDS.In neonates with moderate RDS 12(42.8%) in surfactant group & 16(59.2%) in control group showed mortality. In neonates with severe RDS showed highest mortality in surfactant group when compared to control group. 3(75%) in surfactant group and 5(55.5%) in control group showed mortality.

There is a significant correlation between the use of antenatal steroids with the outcome. 9(81.8%) out of 11 in surfactant group and 19(95%) out of 20 in control group did not receive any steroids showed maximum mortality when compared to one who received antenatal steroids.

In the study group, the time at which the procedure is performed had relation with its recovery, mortality, and the need for MV. Out of 36 neonates in surfactant group 15 cases were given surfactant within 2hrs of age in whom 12 cases recovered and 4 required MV in whom 3 cases expired. 19 neonates of surfactant group received the dose between 2-6 hr of age in whom only 9 cases recovered and 12 needed MV in whom 10 cases expired. In 2 cases who received surfactant dose >6hrs, none survived.

There is no significant difference in the mean a/A ratio at the time of admission in both the surfactant and the control group being 0.26±0.09 & 0.25±0.09 respectively.

The mean value of the a/A ratio in the surfactant group were 0.21±0.06 in pre surfactant group and 0.33±0.09 in post surfactant group (p = 0.0001**). In the control group the ratio is 0.25± 0.08 in Pre ventilation group and 0.23±0.09 in post ventilation group. There is a significant increase in a the oxygenation in the surfactant group compared to control group after the intervention.

The mean post surfactant a/A ratio in the early surfactant is 0.38±0.08 & late surfactant is 0.30±0.08 which is significant.

Out of 36 neonates who received surfactant 8(22.2%) showed apnea and 7(19.4%) in the control group showed apnea. The most common cause of death is pulmonary haemorrhage 28% in surfactant group whereas 20% in control group. The patients requiring the intensive care is less in the surfactant group compared to control group with the mean stay of 7.00±3.86 & 8.83±2.75 in surfactant and control group respectively and is statistically significant.

The total length of duration in the hospital is almost similar in both the groups. The reason being other than the respiratory problem in the surfactant group like NEC, and feeding problems. But the patients requiring the intensive care is less which may lessen the cost for the treatment and make it as a cost effective treatment.

Discussion

In our study there is 22.2.% decrease in the need for MV in surfactant group compared to control group. This is in comparable with other studies like Reininger et al 20% [8], Bohlin et al 19% [9], Rojas et al 13% [10]. All studies conclude that the use of surfactant decrease the need for subsequent ventilation there by preventing secondary surfactant deficiency.

The mortality in our study is very high when compared to other studies because of delay in the intervention, many of the patients are extramural came late to the hospital and the financial issues and the delay in the consent from the parents regarding the surfactant administration most of the patients are illiterates and belong to lower socioeconomic status.

In our study early surfactant had low mortality when compared to late surfactant administration compared to verder et al study it is 9% & 26% respectively.

The oxygenation is calculated by the a/A ratio.In our study the (Mean±SD) before and after surfactant

administration is 0.21±0.06 & 0.33±0.09 respectively and in Reininger et al it is 0.34 (0.10-0.84) & 0.45(0.10-0.92) respectively. While in Dani et al study it is 0.28±0.13 & 0.47±0.17. In ventilated cases the a/A ratio before and after ventilation is 0.25±0.08 & 0.23±0.09. In Reininger et al study it is 0.40(0.08 - 0.86) & 0.29(0.08-0.96). In Dani et al study it is 0.21±0.14 & 0.48±0.13. The a/A ratio is increased in surfactant group after administration than the control group in both our study and Reininger et al study. In Dani et al [11] study they compared surfactant administration with both ncpap and MV where there is an increase in pre and post SUFR-CPAP & SURF-MV group.

The increase in oxygenation in early surfactant group is more when compared to late surfactant group in both our study and Verdr et al study[12].

The duration of MV if needed in surfactant group even after 4th day is 1(2.1%) in our study group and 22 (61.1%) in control group in comparable with Nayeri et al study it is 5(23.8%) & 14(66.7%) in cases and controls respectively [13].

The Mean total length of stay in the hospital in our study is 10.00±7.63 & 10.83±4.59 between surfactant and control group. But the stay in NICU requiring intensive care is 7.00±3.86 & 8.83±2.75 respectively and is statistically significant.

Conclusion

This study concludes that among spontaneously breathing premature infants treated with INSURE , tdecreased the need for subsequent MV by 22% . The higher birth weight, the use of antenatal steroids, the lower RDS score at the time of procedure and the early use of surfactant as the good predictors in the INSuRE success group. There is a significant decrease in the need for MV in the surfactant group compared to control group.The reduction in the need for MV decreased the risk of airleak syndrome and is advantageous in medical settings where resources are limited like in our country.

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